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CROONIAN LECTURES  
ON THE  
HYGIENIC AND CLIMATIC TREATMENT  
OF  
CHRONIC PULMONARY PHTHISIS

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# PULMONARY PHTHISIS



CROONIAN LECTURES  
ON THE  
HYGIENIC AND CLIMATIC TREATMENT  
OF  
CHRONIC PULMONARY PHTHISIS

DELIVERED AT THE  
*ROYAL COLLEGE OF PHYSICIANS*

BY  
HERMANN WEBER, M.D.

FELLOW OF THE COLLEGE : PHYSICIAN TO THE GERMAN HOSPITAL

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## P R E F A C E.

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HAVING been asked for copies of these Lectures by professional friends abroad and in England, I venture to publish them separately, encouraged by the favourable opinion of the Medical Press. The circumstances of their delivery, especially the limitation to three hours, must be my excuse for their very fragmentary character. Enough, however, I think, has been said to show the importance of the further development of the treatment of Phthisis by open air, by exercise and climate, under strict medical guidance; and also to show the necessity of numerous special hospitals and health-establishments for the treatment of those consumptive invalids who are not rich.

I further wish to lay stress on the fact that it is the duty of our profession to teach the public that it

is a great mistake to think that the invalid and his friends are able to manage the dietetic and hygienic treatment of consumption, or that it is enough to go for a season, or for several seasons, to a certain climatic health-resort, and that the climate itself is able to cure phthisis, without the assistance of local doctors. Many valuable lives are lost through this error, even under the most favourable climatic circumstances,—lives which might be saved under strict medical guidance.

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# CHRONIC PULMONARY PHTHISIS.

3



## LECTURE I.

Definition of phthisis—Infectiousness—The bacillus—Differences in the liability of different persons to phthisis—Acquired and hereditary predisposition—Curability of phthisis—Circumstances influencing the prognosis—Deplorable condition of the consumptive poor—Preventive treatment.

MR. PRESIDENT, FELLOWS, AND GENTLEMEN,—Drs. Wm. Ewart,<sup>1</sup> J. E. Pollock,<sup>2</sup> and Andrew<sup>3</sup> have delivered before you in the course of the last few years lectures on important points in the ætiology, pathology, and treatment of phthisis. I intend to confine myself as much as possible to the hygienic treatment in the widest sense, which includes the dietetic and

<sup>1</sup> *Gulstonian Lectures on Pulmonary Cavities &c. Lancet and Brit. Med. Journal, 1882.*

<sup>2</sup> *Modern Theories and Treatment of Phthisis.*—Croonian Lectures, *Lancet*, 1883.

<sup>3</sup> *Ætiology of Phthisis.*—Lumleian Lectures, *Lancet*, 1884.

climatic management. Graves said: 'It is of great importance to know how to make a man phthisical, as by pursuing an opposite line of conduct we shall be able to prevent it.' In these words lies my excuse if I do not altogether avoid questions of ætiology and pathology.

While the lectures of my predecessors to whom I have just alluded were full of scientific research, mine claim only a humbler place; but if I were only able to put the matter as I see it before you and the profession in general with sufficient clearness and force, I should hope to be fortunate enough to contribute a small share towards the development of a more energetic and somewhat more successful prophylaxis and treatment of phthisis, especially in the poorer but also in the richer classes.

As the word 'phthisis' has had such different meanings at different times, and at the same time, in the minds of different men, I must state what I mean by pulmonary phthisis—viz., a chronic disease of the lungs, with consolidation, beginning almost always at the apex, having a tendency to caseation, softening, and the formation of cavities, or of fibrous changes. All these changes may occur in the same individual at the same time in different parts of the lungs, or may follow one another at different periods of the disease.

These changes are endowed with infective qualities, and have a disposition to spread to the adjacent parts, and to become also disseminated over distant parts. They are mostly found associated with the tubercle bacillus discovered by Koch, a point to which we shall presently return ; and they are intimately connected with, we might say engrafted on, a state of malnutrition of the whole organism, and especially the cells and the tissue of the lungs.

I claim no originality for this definition, which is not exhaustive, and which I have given only for the purposes of these lectures. It is derived principally from the remarks made by Drs. Green,<sup>1</sup> Wilson Fox,<sup>2</sup> and others during the discussion at the Royal Medical and Chirurgical Society on Dr. Percy Kidd's paper on the 'Distribution of Tubercle Bacilli in the Lesions of Phthisis.'<sup>3</sup> I exclude the lung diseases often called phthisis, which are caused by mechanical irritation through inhalation of inorganic or simple organic dust, the different forms of bronchiectasis, chronic bronchitis, or emphysema and heart disease, chronic changes resulting from pressure on the bronchus, the diseases of hydatid origin, cirrhosis, empyema, and syphilitic changes of the lungs.

<sup>1</sup> *Proceedings of the Royal Med. and Chir. Society*, 1884-5.

<sup>2</sup> *Ibid.*      <sup>3</sup> *Ibid.*, and *Medico-Chir. Transactions*, vol. 1884-5.

With regard to the infective power of the changes in the lungs of phthisical subjects, they have been surmised long ago, even before the history of inoculation, which dates back at least as far as 1843, when Klencke<sup>1</sup> made some experiments which were almost forgotten when Villemin<sup>2</sup> published his famous researches. The late William Budd, you remember, was perfectly convinced of the infectiousness of phthisis. On more than one occasion, when discussing the subject with him, he expressed his astonishment that the view of the infectiousness was not universally credited. Mr. William Thompson<sup>3</sup> of Melbourne, amongst others, has constantly asserted his belief in the communicability of phthisis.

Possibly this view would not have been so generally accepted even now if the ideas of the profession with regard to zymotic diseases had not been gradually transformed by the researches of Pasteur,<sup>4</sup> to whom the greatest praise is due, although he was

<sup>1</sup> *Untersuchungen u. Erfahrungen im Gebiete d. Anatomie, &c.*, vol. i. Leipzig, 1843.

<sup>2</sup> J. A. Villemin, *Etudes sur la Tuberculose, &c.*, 1868, and previously in the *Bull. Acad. Méd.* for 1865 and 1866.

<sup>3</sup> William Thompson, *The Histo-chemistry and Pathology of Tubercle*, Melbourne, 1876; and *The Germ Theory of Phthisis Verified*, Melbourne, 1882.

<sup>4</sup> An interesting account of Pasteur's researches will be found in *Louis Pasteur, his Life and Labours*, by his son-in-law. Translated by Lady Claude Hamilton. Longmans, 1885.



preceded in some points by Schwann, that type of the modesty of genius, and had not the marvellous results obtained by Lister's disinfecting process acted as a stimulus to the germ theory in general. Pasteur's intelligent and never-resting industry paved the way for a number of other scientific observers and experimenters, as Davaine, Obermeier, Cohn, H. V. Carter, Cohnheim, Klebs, Wilson Fox, Burdon Sanderson, Baumgarten, Lister, Tyndall, Tommasi-Crudeli, Klein, and others ; so that Koch's<sup>1</sup> discovery of the tubercle bacillus came to us like a long-expected message.

Dr. Andrew especially dwelt on the importance of this discovery in his lectures on the *Ætiology* of Phthisis, where he justly said that 'not many discoveries of equal importance' have received such speedy and strong 'confirmation as that of the tubercle bacillus.' Mr. Watson Cheyne has given a full, clear, and confirming account, based on a visit to the Continent and many experiments performed by himself.

The literature on the subject in this country, as also in France, Germany, Italy, and America, is already very large, and has received an important addition by the paper already mentioned by Dr. Percy Kidd, and the discussion which followed it.

<sup>1</sup> R. Koch, *Mittheilungen aus dem Kaiserlichen Gesundheitsamt*, vol. ii. Berlin, 1884.

In spite of the large array of authors and papers, however, we cannot say that we know all about the bacillus, by which term I understand not only the developed little rod, but also its spores and the chemical poison which probably is originated by its development in the tissues in an analogous manner to that in which, according to the researches of Gaspard, Panum, Billroth, Burdon Sanderson, and others, a powerful chemical poison—sepsin—is developed in the process of septicæmia. We have no doubt that the bacillus is intimately associated with phthisis, but the exact relations appear to require still further elucidation. It is, for instance, not quite clear why the tubercle bacillus thrives in some persons and not in others, or why in some persons it thrives at one time and not at another.

It seems to be an acknowledged fact that some micro-organisms do not grow in living tissues of a living animal. Klein<sup>1</sup> states this with regard to the 'septic and zymogenic organisms properly so called,' and explains their occurrence in diseased tissues during the life of the subject by assuming that these tissues had become changed by inflammation or otherwise, so as to become practically dead before the organisms could grow in them. By analogy, the

<sup>1</sup> E. Klein, *Micro-Organisms and Disease*. Macmillan, 1884.

question arises whether the tubercle bacillus settles and grows in healthy living tissues of the body, or only in pathologically-altered tissues. We know that it thrives in the bodies of most warm-blooded animals when inoculated, but this does not prove that it will find a nidus in the healthy tissue when merely brought into contact with it by the surrounding air.

The first point which we have to consider is that the air which we inhale perhaps does not so often contain the fully-developed bacillus as it is supposed by many people, for this microbe does not thrive in the air at the usual temperature, but requires, according to Koch, a temperature approaching that of the human body. Its growth entirely ceases below about  $82^{\circ}$  F. and above  $107^{\circ}$ , and it thrives best at about  $98^{\circ}$  to  $100^{\circ}$ , while other pathogenic microbes have a much wider field ; for instance, the anthrax bacillus, which grows luxuriantly between  $67^{\circ}$  and  $74^{\circ}$  and up to  $110^{\circ}$ .

A further point against the spread of the tubercle bacillus out of the animal body is that it does not form spores in the air, while the anthrax bacillus does. Another peculiarity in the life of the former is that it grows slowly, that it requires as many days for its development as the anthrax bacillus requires

hours. This circumstance seems to diminish our danger considerably, for we may presume that the bronchial mucous membrane, when healthy, materially assists the expelling act of expiration by its ciliary functions. We are, however, less secure when by catarrhal or inflammatory conditions the mucous membrane of the bronchi, and especially of the smallest divisions, is deprived of its protecting surface, and when the respiratory acts are imperfectly performed, especially the expiration, thus allowing the stagnation of impure air in the alveolar spaces, and permitting the bacilli and their spores to develop under circumstances most favourable to them.

This leads me to another subject in the relation of the bacillus to phthisis, which appears not finally settled—viz. the chronic affections of the apex, which are usually regarded as incipient phthisis. Every one of us has seen numerous cases of this kind characterised by some degree of dulness, mucous rhonchus, and more or less pyrexia at one time or other. Many of these cases are followed, after a shorter or longer time, by an extension of the disease to other portions of the lung and fatal termination. Not a few cases, however, become arrested and retrogressive, and ultimately to all appearances cured. These apparent cures are not always permanent, but

after intervals of from four to six months, or some years, a similar affection is started again, either in the same or in the other apex, or in both, and may rise into fully-developed phthisis, or be again arrested.

In looking over my notes, I have found eleven cases in which the arrest or cure has now lasted from five to twenty years without a relapse, so that the cure may be regarded with some degree of assurance as permanent. What was the nature of these cases? Were they bacillary or non-bacillary? I cannot answer the question with any degree of certainty, as the bacillus was not known at that time, and only its constant absence in the sputa could have pointed with probability to the non-bacillary character of the affections. I am inclined to believe (1) that some of the apical affections which I have seen were non-bacillary, or, in other words, the result of chronic catarrh and inflammation without the presence and influence of bacilli; while the greater number were complicated by the presence of the parasite, and partly caused by the latter; (2) that non-bacillary cases are apt to become bacillary by the settling of the bacillus in the diseased cells and tissues; (3) that bacillary cases may, under favourable circumstances, become non-bacillary.

The recent discussion already referred to at the Medical and Chirurgical Society has not cleared up the question. Dr. Wilson Fox in his philosophical remarks told us we ought not to be too quick in accepting all which the new views of the bacillary origin of phthisis required, considering that the pathology of tuberculosis had biennially, triennially, or quinquennially been swayed by histological dogmata. Dr. Green, on the other hand, seemed more thoroughly to accept Koch's discovery, as being in perfect harmony with our older views and his (Dr. Green's) definition of phthisis. He questions the existence of pre-tubercular consolidation of the apex, which term, in Dr. Green's remarks, may perhaps be understood as equivalent to non-bacillary consolidation, which I have used above. He appeared, however, not quite certain on this point. In some cases of disease of one apex, he said, where there was no evidence of softening and disintegration it was difficult to say whether they were tubercular or not.

I have been told that it is imprudent to discuss, in our present state of transition, the question of the treatment of phthisis. But I do not quite share this opinion. If we could hope that by further acquaintance with the nature and life of the bacillus we could at an early date discover a method of attenuation of

the tubercle virus for inoculation, or means of destroying the bacillus and its spores, either in the air we breathe or in our tissues, or substances by which without injury to ourselves some slight alteration in the chemical constitution of our cells and tissues could be effected which would render the thriving of the bacillus impossible, I should certainly wait; but I do not think that we are justified in entertaining such hopes for the near future, although the discovery of some such means does not appear to me at all impossible.

We are not so fortunate as surgeons with regard to keeping off the entrance of spores into wounds and sores. The ingenious respirators invented by Tyndall and Frankland are certainly not without practical value, but their use will, I fear, never be general; and when once the system is infected, we do not yet know of parasite-killing remedies which, in sufficient doses, would not injure the host together with the parasite. Even the surgeon, when once pyæmia or septicæmia is established, has hitherto found himself powerless to arrest the progress of the disease by means of antiseptic remedies administered internally. He even has great difficulty in disinfecting an external sore when complicated with sinuses. I well remember a conversation with Sir Joseph Lister

on this subject, when he held out no hope that we might at an early date succeed in disinfecting an infected lung. The conversation I refer to occurred some years ago, but I have no reason to believe that Sir Joseph has altered his views since then.

Although, however, we possess no direct means of destroying the parasite, we need not despair of doing good by placing persons under circumstances in which they are less liable to become infected, and when infected more able to limit the progress, and to effect a more or less perfect and more or less permanent cure. We know that the reputed cause of danger, the tubercle bacilli or their spores, exists in many localities, and yet, fortunately, the majority of people remain free from tubercles ; and that some only become infected after some accident, some lowering influence, mental or physical, or some catarrhal inflammatory affection of the respiratory organs, or some febrile disease, as measles, or whooping-cough, or typhoid fever. There is reason for the inference that under such depressing influences the resisting power of the body, and especially of the lungs, becomes impaired, and that thus the pathogenic germs are more likely to find a nidus for their development. This diminished resistance thus produced constitutes the complex class of *acquired predisposition*, which may be transitory or permanent.



Our duty is to prevent the occurrence of this predisposition, and when formed to remove it by improving the state of nutrition. And a further duty is to prevent, during the existence of this acquired predisposition, the risk of infection.

There is, besides, an equally large, if not larger, class of persons who have *hereditary predisposition* to phthisis. We must avoid entering on the exact nature of this heredity, whether it consists—as Professor Sée, in his very interesting work, ‘*Phthisie Bacillaire des Poumons*,’ argues—in direct transmission of the virus from parents to offspring, or whether only in the transmission of certain predisposing defects. But we shall, under the head of ‘prophylactic treatment,’ return to the consideration of the duties which the existence of heredity imposes on us.

Before I enter on these duties, I must say a few words about prognosis, and endeavour to meet the gloomy views which so many medical men still entertain. That anyone can hold the opinion that phthisis is incurable is almost incredible; as not only older medical authors, but many of the most experienced living men, have pronounced distinctly hopeful views. The words of Carswell should be sufficient. ‘*Pathological anatomy*,’ he says, ‘has perhaps never afforded more conclusive evidence in proof of the curability

of a disease than it has in that of tubercular phthisis.'

Every one of us has, I doubt not, often met with this proof in making post-mortem examinations of persons who had died of other diseases. The instructiveness of most of such cases, however, is greatly diminished by the fact that the conditions of the persons at the time when the attack had occurred are unknown ; as also the circumstances under which the cure had taken place. As a great interest is attached to cases whose history is known, I venture to give a short sketch of a case in which I had the opportunity of witnessing two separate attacks of phthisis, terminating in recovery, and finding the remains of the lesions by post-mortem examinations even years after the second recovery, when death had occurred from typhoid fever with perforation.

C. M——, aged twenty-one, with a history of phthisis on the part of his father, came under my observation in July 1867, on account of hæmoptysis. He had previously had attacks of 'bronchial catarrh,' as he called it. There was dulness, with crepitant rhonchus, over the left apex down to the fourth rib, and also on the supra-spinal region. The right side was free. Moderate pyrexia ; loss of flesh. With rest in bed and on sofa, with open windows, light cold food

and ergot of rye, the bleeding soon ceased. There was subsequent general improvement after removal to Weybridge, where he was ordered to be, during the greater part of the day, in the pine forest of St. George's Hill, to take frequent meals, and cod-liver oil, with small doses of arsenic. He was then advised to spend ten or twelve months at Davos or St. Moritz, but as this advice was described by an authority who was separately consulted as due to my 'cold-loving idiosyncrasy,' C. M——, having found an engagement at Cape Town, went there. At that place he was disagreeably affected by the wind and dust, and was therefore sent to the high ground amongst the Boers, where he spent six months of the cool season in several farms at elevations of between 4,000 and 6,000 feet, being constantly in the open air, with abundant exercise on horseback and walking. He entirely recovered, and was afterwards for some years at Cape Town and in the neighbourhood, in perfect health.

In January 1873, after a year's residence in Paris and London, he was again seized with hæmoptysis. The left apex had remained free, showing only slight dulness and flattening, and occasionally a dry crackle, but no moist rhonchi ; while the right apex was in an analogous condition to that in which the left had been in 1867. Under similar treatment he again improved,

and, being a good sailor, he went on board a sailing-vessel to Valparaiso. On the voyage the cough almost subsided ; but at Valparaiso, where he began office work, it became worse, and he was advised to carry out my previous suggestion to spend a year at Jauja in the Peruvian Andes, whence he returned to Valparaiso in perfect health.

In 1878 I had the opportunity of examining C. M — , when on a visit to Europe. The former flattening and dulness over the left apex had as much as disappeared ; the breathing was only somewhat harsh, with prolonged expiration ; but over the right apex there was slight dulness on percussion, some flattening, and harsh long expiration. He was able to bear any amount of fatigue, but no confinement to close rooms and office work. I did not see him again till he came in August 1881 from Italy and France, with well-developed typhoid fever of a moderate type, without any lung complication. He had almost recovered, when at the end of the fourth week of the disease he committed, against strict advice, the imprudence of eating a rather large quantity of grapes. Perforation of the lower part of the ileum took place within twenty-four hours of this meal, from a sore which had been in fair progress of healing, almost all the other patches being already healed.

There were cretaceous patches in the apices of both lungs, and also in the lower lobe of the right lung, with the often-described changes in the surrounding tissues.

Whether these two attacks of phthisis were bacillary, and, if so, whether the encapsuled cretaceous and semi-cretaceous masses still contained bacilli and spores, are questions which naturally offer themselves. If the bacilli and their spores can retain their life for years in such encapsuled masses, then it is very possible, as has been suggested by others, that the fresh attacks of phthisis which occasionally occur after years of apparently perfect cure are in some cases due to self-infection from the escape of imperfectly-shut-up parasites. A case lately published by Dr. Neuwerk of Tübingen tends to show that bacilli may really exist in such old encapsuled masses. The main points of the case are these:—A ranger in a healthy district of Prussian Silesia, who served in the Franco-German war of 1870-71, in perfect health, and passed in 1875 a medical examination as a good life, suffered in 1877 during six months from cough, anæmia, emaciation, and a general feeling of illness; he recovered, however, while continuing his open air duties, and then remained well for several years, till cancer of the stomach developed itself, from which he died.

The post-mortem examination disclosed in both apices, which were contracted and puckered, cretaceous masses of different consistence, and also caseous nodules, in one of the latter of which Dr. Neuwerk found well-developed bacilli after having searched in vain for a long time. He ascribed the phthysical changes in the lungs to the illness in 1877.

Dr. Neuwerk's case and the one related by myself have this in common: that indubitable attacks of phthisis were cured by what may be called 'open-air treatment,' and that death occurred, not from phthisis, but from other diseases. These cases, if we had no other proof, would in themselves be sufficient to show that phthisis is sometimes cured, and I do not hesitate to assert that it is often cured.

There is nothing more baneful than the idea that phthisis is incurable. It shuts out all honest attempt to do everything possible, and bring every sacrifice to promote arrest and cure. I well remember from my student's time, when phthisis was considered almost incurable, how the name of the disease was withheld from patients; how depressed they became when they found it out; how they regarded themselves as doomed, and sometimes killed themselves by poison or debauchery. I remember also the joy amongst the younger medical generation and the

public when a more hopeful view developed itself, and the readiness to submit to every sacrifice and to long expatriation with a fair chance of recovery. I will not mention the names of the living men who have worked in this direction, but I cannot help paying a tribute to the memory of Graves, Carswell, Archibald Smith, Addison, and Felix Niemeyer.<sup>1</sup>

The portions of lung which are already destroyed before the treatment has commenced cannot be restored, but experience has shown to us that life, with a fair capacity for work and for enjoyment, can be maintained after a loss of a good part of the lungs, and that the remaining part, if sound, can be rendered capable of doing the ordinary life-work of both entire lungs, though it must always remain unfit to perform the extraordinary duties which can be occasionally demanded from the combined power of both lungs unimpaired by disease.

That even the presence of a cavity does not preclude a cure more or less complete, all the best observers of England, and many of the Continent, have proved. The phenomena of cavities have been carefully studied by Dr. C. T. Williams, Dr. Douglas Powell, and especially by Dr. William Ewart, whose

<sup>1</sup> An excellent English edition, by Professor Bäumler of Freiburg, of Felix Niemeyer's *Lectures on Consumption* has been published by the New Sydenham Society.

Gulstonian Lectures of 1882 contain the fullest account of the pathology of cavities I am acquainted with. In some cases the formation of a cavity, as Professor Jaccoud and others have pointed out, is even favourable, provided the infectious contents can be thoroughly evacuated, and a fibrous zone of demarcation be established between the cavity and the surrounding healthy tissue. The tendency to fibrous change in this, as in all other processes of phthisis, is one of the most powerful agencies towards prolongation of life, and in many cases towards arrest and cure of the disease.

There is a species of constitution which does not fight well when attacked by any serious disease, and especially by phthisis. I cannot satisfactorily define this complication of anatomical and physiological peculiarities of cells and tissues and nerve functions, which our old physicians, especially in Germany, used to call the *erethic constitution*. A slight injury or a slight cause of irritation produces constitutional effects, especially pyrexia, quite out of proportion, and the effects do not readily disappear. The equilibrium of health is not easily regained. The pulse is generally rapid, the appetite varying, the mucous membrane irritable, and sleep imperfect. This constitution is always associated with a certain degree of



asthenia, sometimes patent, sometimes masked. For the sake of shortness, we might, I think, use this term when referring to the constitutional peculiarities just mentioned. The general treatment, and especially the climates, most useful to other consumptive patients, are not easily adapted to this constitution. The prognosis of the developed disease is bad. Prophylactic treatment is imperative.

A most important point in the prognosis is the degree of *intelligence* and *judiciousness* of the patient, and in many instances of the patient's friends. The delicate or sick persons who have an insight into their own condition, in the wider sense of the word, and into those influences which act beneficially on them and those which are injurious, have a better chance of recovery than those who are less intelligent, who do not see the bearing on health of all the numerous items of daily life, most trivial in appearance, but all-powerful in their accumulated action. A circumstance of almost equal importance is the *possession of means* to carry out the most suitable treatment. No other disease demands so many and such long-continued sacrifices as phthisis, and those who are able to make them have, as a rule, a greater chance of recovery than those who are not. The poor deserve our greatest sympathy. While in the majority of other

diseases the ordinary hospitals place the poor almost under the same favourable conditions as the rich at their homes, this is by no means the case with phthisis ; on the contrary, the majority of general hospitals are very ill adapted, and the well-arranged special hospitals for the treatment of consumption have accommodation only for one sufferer in a thousand. I wish, gentlemen, I could not only induce you to see this in the same light that I do, but also to use your influence with the public gradually to fill up this great gap in our philanthropic institutions.

*Preventive treatment.*—In discussing the treatment of phthisis it is impossible to restrict ourselves to that of the developed disease, and to pass over the prophylactic or preventive treatment. The latter is, indeed, in many cases, all that gives us any chance, for in some constitutions the disease, once established, runs a rapid course to the end, or at best cripples the patient for life ; and many of those endowed with better constitutions do not possess the means to submit to treatment which often must be extended over many years.

The question of preventive treatment has been ably discussed by many authors—Drs. MacCormac, Pollock, Jaccoud, Rühle, amongst others ; and quite lately in a comprehensive way by Ewald in his address

to the International Medical Congress at Copenhagen. Some of the questions relating to the prevention of phthisis ought to belong to public hygiene and State medicine—for instance, whether to destroy cows affected with tuberculosis, whether to permit the flesh and milk of such animals to be consumed; the hygienic arrangements in school-board schools, the playgrounds connected with them and the superintendence of the games, the number of school hours; the condition of factories and the work at factories, the buildings for the accommodation of working people and their families, the barracks, &c.

The questions of infectiousness and communicability of phthisis are not yet sufficiently settled to lay down prophylactic rules with regard to them, but they ought to be carefully and calmly investigated in all their bearings. I have only to deal with them in the preventive sense, not as ætiological questions, but both cannot be quite separated. Dr. Andrew has fully discussed them in his Lumleian Lectures, and though we may not in all points agree with him, his reasoning, based on historical data and personal experience, deserves thoughtful examination.

There is in Dr. Andrew's discussion no sign of a feeling which is so apt to intrude itself unconsciously on the inquirer, and sometimes to influence his judg-

ment. I have, for instance, heard from intelligent men the view that it would be cruel to shun the consumptive, who is already much afflicted, to check the intimate intercourse between him and his nearest and dearest friends, or to render his condition intolerable and promote the fatal termination of his disease by not allowing him to marry. If we could think that by allowing intimate intercourse and marriage the disease could not be spread, it would certainly be cruel to give pain, but if experience and investigation should teach the opposite, then judgment ought to have precedence before feeling.

We are, I suppose, all convinced that infection can take place by inoculation, and this may possibly occur more frequently than is thought. Several instances are recorded ; I remember just now two occurrences. The first is related in a communication by Dr. Lindmann in the '*Deutsch. Med. Woch.*,' 1883 ; two children who were circumcised by a man who was in the last stage of consumption, and who, after circumcision, sucked the prepuce according to the Jewish rites, became both infected with ulcers on the prepuce and swelling of the inguinal glands, and the ulcers had the appearance of tuberculous ulcers. One of the children recovered after some months. In the other the glands became ulcerated, and caseated masses were removed

from them. The child then apparently recovered, but in the third year it perished from Pott's disease and rapid phthisis.

The second occurrence is recorded by Dr. Reich, in the '*Berlin. Med. Woch.*,' of 1878. The midwifery practice in the small village of Neuenberg was pretty closely divided between two midwives. One of the two became consumptive in 1874, and died in July 1876. Ten children without hereditary predisposition attended by this midwife between April 1875 and May 1876 died within the first seventeen months of their lives; while none of those died who were attended by the other midwife, and while tubercular meningitis is a rare disease at Neuenburg. The consumptive midwife was in the habit of sucking the mucus from the mouth of the new-born children and blowing air into the mouth when there was the slightest sign of asphyxia. In this occurrence it is perhaps doubtful whether it ought to be explained by inoculation, or by contagion in the more ordinary sense of the word. It is probable that more cases of inoculation will be observed when once general attention is directed to this point.

I remember two cases which I am now inclined to explain in this way, though at the time of their occurrence I had not done so. The first was in a wet-nurse

who nursed a consumptive child ; she first had an ulcer at the side of the tongue, which was regarded as due to a rough tooth, which, however, did not heal after the tooth had been filed, and was not cured by borax and other local applications. Several months later she lost her voice, and ultimately died from phthisis. I am inclined to think that a slight sore on the tongue had been inoculated and formed the starting-point of phthisis in this woman, who was free from hereditary predisposition.

The second recollection relates to a mother who nursed a consumptive daughter, fifteen years old, with whom she shared the same bed and whom she constantly kissed. She, likewise, had first a sore on the tongue and afterwards on one of the tonsils before she manifested any signs of pulmonary consumption. But in this case the mother belonged to a somewhat, though only slightly, tainted family, and her husband had died from phthisis. Although she had been apparently quite well before she nursed her daughter, yet she may have had latent phthisis before the sores on the tongue and tonsil made their appearance.

On the question of contagiousness of phthisis the views of medical men will probably remain divided for a long time to come. The facts brought forward

by Drs. Theodore Williams, Pollock, and Andrew are very encouraging, and we may be sure that phthisis is not in the same way communicable as scarlet fever and smallpox are. But we must bear in mind that there is more intimate intercourse between husband and wife, and near relatives sleeping in the same room, and even the same bed with consumptive persons, than between nurses or doctors and patients, and that, besides, the hygienic arrangements at the Brompton Hospital and at some of the best general hospitals are much better than those of many small private houses. Since I read a paper on the 'Communicability of Phthisis between Husband and Wife'<sup>1</sup> at the Clinical Society more than ten years ago, I have not met in my own practice with any such striking cases as those which I then related, so that I am happy to think that they are rarer than it seemed to me at that time; but I remain convinced, from clinical facts, of the communicability of phthisis under certain circumstances, and the experimental researches of Tappeiner, Veraguth, and Schäffer ought not to be forgotten.<sup>2</sup>

<sup>1</sup> On the Communicability of Consumption from Husband to Wife, *Trans. of the Clinical Society of London*, vol. vii. p. 144, 1874.

<sup>2</sup> The most recent communication on the subject which I have just received comes from the United States of America: *Facts serving to prove the Contagiousness of Tuberculosis*, by W. H. Webb, M.D. Read before the College of Physicians of Philadelphia, February 4, 1885.

In preventive medicine, therefore, the infectious character of phthisis ought to lead to certain precautions, of which I can mention only the most salient. Persons affected with consumption, for instance, especially the subacute forms, ought not to be allowed to perform offices by which breath, saliva, or sputa are brought into close contact with healthy, and still less with very young or weak and diseased people or persons with an acquired or inherited predisposition. Not without reason physicians have forbidden kissing between consumptive patients and other persons ; but this prohibition recalls to my mind a beautiful German poem by Scheffel, in which a famous tom-cat, a prince of cats, watches from his throne on the roof the doings of mankind, and soliloquises on that trait of human beings, to kiss one another, especially in the time of youth. From this poetical cat's cogitation, I infer that kissing is a part of man's nature, and nature, I fear, cannot be stopped.

*Naturam expellas furca, tamén usque recurret.*

The secretions and excretions of consumptive persons and the wearing apparel, bedding, &c., soiled by them, especially the expectoration, should be disinfected and carefully removed. Woollen articles of furniture ought also to be avoided or frequently



changed for disinfection. No dust ought to be made in sick-rooms or wards, as the microbes are likely to be moved about in this way. The cleaning of rooms and furniture by a dry process of sweeping and dusting ought therefore to be forbidden. Ventilation of the sick-room ought to be most abundant, not only for the sake of the sick persons themselves, but for those in contact with them, and the latter ought to be much in the open air and attend to their health by all other means, in order to keep up their power of resistance.

It is our duty to prevent as far as lies in our power the marriage of consumptive persons, and even of persons who, though not actually consumptive themselves, belong to families with a strong consumptive taint. We must at all events endeavour to convince those with whom we come into professional contact of the importance of this duty, but notwithstanding all this, our advice will often be disregarded, and those who know the meaning of the wonderful word 'love' and its equivalent in other languages cannot be astonished at it.

Failing in the prevention of marriages, we must direct our attention to the management of those affected with *hereditary tendency*. The infants of consumptive mothers ought never to be suckled by the latter, but ought to have perfectly healthy wet-

nurses, or if this be impossible, they ought to live on milk from sound cows, or donkeys, or goats during the first year—boiled if there is the slightest cause for suspicion as to purity ; and milk ought to form during the first six years the principal article of food, and ought only gradually to be in part substituted by other animal food with an admixture of farinaceous and green vegetables. I quite agree with Dr. Duckworth's remarks in the *Practitioner* (1881) on the insufficient use of milk as an article of diet in England, with regard to children as well as adults ; and these remarks would be still more applicable to other countries. Those who have been in the country districts of Italy know how difficult it is to obtain milk.

The child ought never to sleep in the same room, and still less, in the same bed with the consumptive parent or any other consumptive person. The child's room ought to be large, with plenty of light, in a southern or south-western aspect, with abundant ventilation by day and by night. Whatever we may think of Dr. Henry MacCormac's explanation of the origin of consumption by the 'breath rebreathed,' it must be acknowledged that pure air is the best means to prevent consumption ; that he has pleaded in favour of it in a more eloquent way than any other

author, and that his teachings ought to be accepted much more universally than has hitherto been the case.

The temperature of the room ought not to be too high, 65° F. being quite sufficient for the very young, and 62° for somewhat older children, and less in the sleeping-room. The skin ought always to be covered with flannel, the clothing warm and loose; there should be daily sponging, with gentle friction. The temperature of the water used is to be gradually lowered, 60° F. being, as a rule, sufficient after the second year. The child ought to be taken out into the open air for several hours every day soon after birth, and later on to spend the greater part of the day in the open air. If it can be arranged, the house ought to be in the country, on a dry slope with sunny aspect. Active exercises ought to be encouraged at an early period, and to be gradually increased as to duration and activity of movement—games, gymnastics, rowing, riding on horseback, climbing, and all kinds of exercises by which the muscles and the organs of circulation and respiration are brought into play, and as a consequence the nutrition of the body improved.

Mental education need not be neglected, but ought to go on, and can go hand in hand with sound physical education; but confined rooms and sedentary

habits ought to be rigorously avoided. No trade or profession ought to be permitted which induces such habits, or which exposes the delicate person to dust or tainted air, but farming, seafaring, and other open-air occupations ought to be selected. The period of cessation of growth and the first year succeeding it require special attention.

But how can this be applied to the children of the poor? I am afraid that I must say that this is one of the problems not yet solved, and perhaps not to be solved in the very near future. Let us at all events lay down these principles for the guidance of those who have influence on the nursing and education of the children of the poor ; and some improvement we may hope will gradually be achieved, and is often achieved already now in individual cases, and in well-arranged orphan asylums. With regard to schools for the poor, too, we can demand the best hygienic arrangements, and playgrounds attached to them, and gymnasia, and drilling masters.

Every one of us has, I suppose, met with instances which prove how much can be done by judicious physical education, even under apparently hopeless circumstances ; yet you will pardon me, I hope, gentlemen, if I relate to you the outlines of a very instructive family history. About thirty years ago

I saw a lady affected with rapid consumption, living in a small street near Bloomsbury Square; the husband a teacher of languages, had just died under my care at the German Hospital of chronic consumption, at the age of thirty-eight. He was a member of a consumptive family. The wife's family too was by no means free from consumption; indeed, out of three brothers and two sisters, two brothers and one sister had already died of the disease. She herself had had seven children, ranging from twelve years to one year of age. The second of these had died from tubercular meningitis. The others—namely, four boys, of twelve, nine, seven, and two years, and the two girls of five and one—were fairly healthy, excepting the youngest boy, who was pale and rachitic.

After the death of the mother, some relatives, intelligent and wealthy at the same time, took entire charge of the children. They took them to their home in a mountainous district of Silesia, one of the healthiest parts of Germany, and brought them up on the plan which I have just sketched. The oldest son remained well as long as he took much outdoor exercise, but at the age of twenty-three he became absorbed in the study of the origin and affinities of languages, worked day and night, gave up exercise, took most of his meals in his study surrounded by books, and

perished from rapid consumption in less than eighteen months. The second son took to farming, and was in excellent health up to the age of twenty-nine, when he found his occupation not remunerative enough, and began to work in a commercial house, being confined to an ill-ventilated office during the greater part of the day, and working, besides this, at home with the hope of gaining a better position. After scarcely two years of this intensified city work he had several attacks of hæmoptysis, and died in less than two years from the outset. The third son has become a cavalry soldier, leading a judicious life, and is a strong and healthy-looking man. The fourth child, then a girl of five years old, is now a country parson's wife, has no children, and is perfectly healthy. The youngest son, rachitic as a child, has become a powerful man, and is a farmer near Manitoba in Canada; and the youngest daughter, staying with him, is likewise strong and healthy.

The history of this family is very instructive. It shows that by favourable circumstances even a strongly-marked family tendency may be neutralised; and this becomes still more manifest when I add that by far the majority—viz. nine out of eleven—of the cousins of these children have died from consumption before the age of twenty-eight. It

further teaches the serious lesson, that if the stringent rules of health are neglected even after the constitution has become satisfactorily developed, the disease may suddenly show itself and run a rapid course.

My experience, indeed, forces me to say that a strong hereditary tendency, especially from the mother's family, requires the strictest attention, not only during the first thirty years, but from infancy to old age, for old age does not shelter from phthisis. I have notes of several cases where with a healthy mode of living the health had been perfect up to fifty, and phthisis was developed afterwards under unhygienic influences. Thus, for instance, C. M——, with a consumptive history on the mother's side, was perfectly well as a sailor up to the age of fifty two, when, on account of a chronic and fatal disease of his wife, he retired from the service, and while nursing her was much confined to the house for many months. Dyspepsia and phthisis developed themselves, and he died at the age of fifty-six. A. D——, likewise with consumptive tendency from the mother, enjoyed good health as a traveller for a commercial house, till at the age of fifty-four he exchanged this occupation for office work as a partner in the house and lived altogether in town. His health began to fail after a year. and he died before he was fifty-nine.

I could mention other similar instances, and have also had the opportunity of seeing repeatedly 'consumption' as the certified cause of death in life insurance cases after sixty, where insurance had been effected late in life, in spite of hereditary disposition, because it had been thought that at so advanced an age the office might be secure with regard to the development of consumption. But I am convinced that where the hereditary predisposition is much marked there is only that 'security' of which the great poet says :

And you all know security  
Is mortal's chiefest enemy.

Altogether there seems to be no good foundation for the general impression that consumption is rare in advanced age. Dr. Sommerbrodt<sup>1</sup> found in twenty-five post-mortem examinations of military pensioners eleven times tubercular lesions as the cause of death, the average age at the time of death being eighty-two. Dr. Würzburg<sup>2</sup> found that in the Prussian monarchy, on comparing the number of deaths at certain ages from consumption with the

<sup>1</sup> Sommerbrodt, *Erinnerungen aus dem Berliner Invalidenhouse*.  
'Deutsche Militär-ärztliche Zeitschrift,' 1883.

<sup>2</sup> Würzburg, *Ueber den Einfluss des Alters und Geschlechts auf die Sterblichkeit in Lungenschwindsucht*. 'Mittheilungen aus d. Kaiserl. Gesundheitsamt,' vol. ii. Berlin, 1884.



number of persons of the same age living, phthisis is decidedly a more frequent cause of death among the old than among the young. Thus he gives amongst 10,000 persons living: ninety-three deaths from phthisis in the period of age from sixty to seventy; nearly sixty-eight from fifty to sixty; only forty-one from thirty to forty; only thirty from twenty to twenty-five. At Copenhagen likewise, according to Lehmann, the death-rate from phthisis to the number of persons living at the same age increases with advancing years up to the age of seventy-five.

There is, however, in this respect a difference between different countries; and in England and France, for instance, the death-rate is greatest between fifteen and thirty-five. It is not easy to say what is the cause of this discrepancy; it may be partly due to a difference in the names given to the diseases in the different countries; thus in England the number of deaths from 'lung disease' in old age is proportionately greater than in Prussia, while that of 'phthisis' in old age is smaller. It is possible that some cases which in England are certified as 'chronic bronchitis' or other 'lung disease' would receive in Prussia the name of phthisis. But part of the difference may be accounted for by the fact that during the much colder winters in Prussia old people are more confined to

narrow, ill-ventilated, stove-heated rooms than is the case in England, where the cold is never great, and where open fireplaces do not allow the air to be vitiated to the same degree.

Much information on this subject may be obtained from Dr. Longstaff's paper in the Journal of the Statistical Society for June 1884, 'On the recent decline in the English death-rate considered in connection with the causes of death.'

The preventive treatment of the *acquired predisposition* to phthisis is similar in principle to that of the hereditary predisposition, though generally it is not required for the whole of life, but only for a shorter or longer period, excepting in those cases where, by deterioration of the health of the parents during the period preceding fecundation, or of the mother during pregnancy, or by unfavourable influences during the first periods of extra-uterine life, permanent weakness or insufficiency has been created. The preventive treatment must be varied according to the constitution and the circumstances of the individual, the causes which have produced the predisposition, and the system or part of the body principally weakened. You will not wish me to enter into details, but allow me briefly to discuss a few points only

A fruitful source of phthisis is the *tendency to*

*catarrh of the respiratory mucous membrane.* It is not to be treated by confinement to hot rooms and by avoiding the open air ; but, on the contrary, by hardening and by accustoming the delicate person, clothed in flannel, but not loaded with clothes, to constant exposure to the air in almost all weathers—walking, driving, riding in open carriages ; by abundant though judicious ventilation of the rooms ; by regular sponging of the skin—at first tepid, perhaps with vinegar, afterwards cold—and by friction ; by strengthening the whole system by nutritious food and by frequent prolonged changes to the seaside or the mountains, according to the nature of the constitution.

These frequently recurring catarrhal affections may form predisposing causes in different ways, especially by producing sore places in the mucous membrane and thus allowing the bacillus to settle ; or by weakening the epithelial cells of the mucous membrane and their ciliary action, or by causing imperfect breathing from unconsciously avoiding deep inspirations in order to avoid coughing, or by weakening the nutrition and energy of the whole system. The latter element is powerful, and by no means rare. Many persons remain excessively weak for a long time after a so-called ‘severe cold,’ and lose entirely their appetite and their inclination to exercise and to work.

The tendency to imperfect breathing which often accompanies protracted colds is best remedied by judicious exercise, even if it causes at first fatigue. Persons presenting the imperfect development of the thorax, often described as the 'paralytic shape,' and the general appearance known by the term 'phthisical habitus,' whether hereditary or acquired, demand similar management, as those subject to constant catarrhs. The imperfect development of the thorax especially requires pulmonary gymnastics, deep inspirations, alternating with complete expirations, breathing with raised arms in order to allow free entrance of air into the apex, judicious climbing of hills and mountains.

It is not only our duty to remove the acquired disposition, but also to prevent the acquirement of it by physical education, general hygiene, and by the management of acute diseases, especially those which affect the respiratory organs, as measles, whooping-cough, diphtheria, bronchitis, pneumonia.

The broad rules laid down by Dr. Wilson Fox, in his article on Pneumonia in Dr. Russell Reynold's 'System of Medicine,' relieve me of the duty of further entering on this subject. But with regard to measles, diphtheria, and whooping-cough, I cannot help pointing out the injurious influence of hot rooms

and fear of ventilation, to which I have been repeatedly obliged to ascribe a share in the cause of phthisis. Change of air to mild seaside or fairly bracing inland places is often important during the convalescence from these diseases, but the fatigue of long journeys is to be avoided.

Preventive medicine has a very large field in the subject of phthisis. I need only remind you of the change in the phthisis mortality of soldiers and prisoners by improved ventilation in barracks and prisons, and we must always have before our minds the important discovery of Bowditch and Buchanan, that drying of the soil by drainage diminishes the mortality from phthisis. The practical application requires no words.

## LECTURE II.

Curative treatment—Relation of doctor and patient—1. Diet—Defective digestion—Raulin's Researches on Mineral Substances—Milk—Times of meals—*Cures of phthisis*—Alcohol—2. Air and ventilation—Open-air treatment—Defective arrangements for the treatment of phthisis in general hospitals—Brompton and Ventnor Hospitals—Necessity for numerous small hospitals for phthisis in the country—3. Exercise—4. Management of the skin—Clothing.

MR. PRESIDENT AND GENTLEMEN,—With regard to the curative treatment of phthisis, the main points which we ought to aim at are: improvement of the general nutrition of the body, or, to use Dr. Beale's expression, of the 'bioplasm'; restoration of healthy respiration and circulation in the lungs; limitation of the existing disease; prevention of fresh outbreaks or fresh infection. The principal means to obtain these ends are: adequate supply of food; abundance of pure air by night and day; regulated exercise; strengthening of the skin; healthful occupation of the mind. We might perhaps say, in other words, that we must aim at improvement of the tissue-change by increased supply of pure air

and nutritive material to the cells and tissues, and by perfecting the elimination of used-up material ; but we must, at the same time, keep off impure air from the diseased spots.

I shall discuss the hygienic treatment under the following heads :—1. Food. 2. Air and ventilation. 3. Exercise and rest. 4. Bathing and management of the skin. 5. Climate.

Allow me, however, Sir, before I enter into these points, to say a few words on the relation of the doctor to the consumptive patient. Shall the doctor frankly tell the latter that his disease is phthisis ? It is still the opinion of many eminent medical men that we should, as a rule, not do so. As long as phthisis was considered an incurable disease, there may have been reason for such concealment, but now, as we know, and can tell our patients, that phthisis is a curable disease, I think the patient ought to be informed of his condition, more or less according to the individuality ; and as far as my experience goes, this has mostly a salutary effect. The patient is more ready to co-operate with the doctor, and to endure the great and long-continued sacrifices, for he becomes aware of his own large share of responsibility.

I have already alluded to the circumstance that intelligence on the part of the patient and his friends

is a great help towards recovery in phthisis, and that want of judgment or insight into the nature of the illness, and of the manifold dangers, and into the means of cure, renders the prognosis less hopeful, unless we are able to place the patient under the strictest superintendence of a judicious doctor, or, still better, in a health-establishment under the control of a resident medical man and his assistants, or in a well-arranged special hospital.

1. *Diet.*—All those who have been successful in the treatment of phthisis have paid much attention to the question of food. Sir Risdon Bennett and many other physicians have shown that by ‘feeding’ alone great service can be done. If the popular idea were correct, that the appetite and digestion of consumptive patients are specially good, it would be more easy to cure phthisis ; but the rule is rather the reverse. The poorer the blood and nutrition of the cells and tissues—the greater therefore the want—the less is often their desire for food. The appetite is not rarely capricious, and the digestion is apt to be disturbed. It happens also that patients object to the diet ordered, and it is therefore sometimes necessary to tell them plainly that without their cordial and constant assistance in this matter they have no chance of recovery. At the same time, however, the fancies of the patient



ought not to be disregarded. The food which he desires, if it is in any way permissible, ought to be procured for him. It ought to be as varied as possible, and the cooking and serving of meals ought to be nice.

The example of others is mostly very useful ; and this is one point in favour of special establishments and health-resorts for phthisis, as at Goerbersdorf, under Dr. Brehmer and at Falkenstein under Dr. Dettweiler. I have also seen at Davos and St. Moritz patients in company with other patients eat and drink, with regard to quantity and quality, what they would never eat in their own rooms alone, or with members of their families. Though it is impossible to lay down fixed rules for all cases, one rule is almost general,—namely, that the majority of those suffering from consumption, excepting some arrested and stationary, ought to take the amount of food required by frequent small meals, and not by only two large meals, as in French, or three meals, as in German and Swiss hotels. This is one of the reasons why ordinary hotels are in general not adapted to the treatment of active phthisis. In addition to breakfast, lunch, and dinner there ought to be four supplementary meals,—namely, early in the morning, between breakfast and lunch, between lunch and dinner, and at bedtime.

Before passing in review some of the principal

articles of food, I wish to direct attention to the possibility that there may be important relations between the life of the tubercle bacillus and the quality of the food that we take, especially the saline materials which enter into the composition of the blood, the cells, and tissues. A short time ago I had the pleasure of listening to a suggestive lecture delivered by Dr. Vivian Poore at the Society of Arts, in which he related the results of most instructive researches by M. Raulin on the growth of the *Aspergillus niger*. A short account of these researches is given in Dr. Duclaux's 'Handbook on Fermentation,' prepared for the International Health Exhibition in 1884. After much trouble, Raulin found the following liquid the best nutritive medium of the aspergillus. It is known as Raulin's liquid :—

Water	.	.	.	.	.	.	1,500 grammes
Sugar candy	.	.	.	.	.	.	70 „
Tartaric acid	.	.	.	.	.	.	4 „
Nitrate of ammonia	.	.	.	.	.	.	4 „
Phosphate of ammonia	.	.	.	.	.	.	0.6 „
Carbonate of potassium	.	.	.	.	.	.	0.6 „
Carbonate of magnesia	.	.	.	.	.	.	0.4 „
Sulphate of ammonia	.	.	.	.	.	.	0.25 „
Sulphate of zinc	.	.	.	.	.	.	0.07 „
Sulphate of iron	.	.	.	.	.	.	0.07 „
Silicate of potassium	.	.	.	.	.	.	0.07 „

By sowing the spores on this fluid, two crops of aspergillus can be grown, which weigh together

25 grammes ; but if we prepare the fluid without the potassium, the gathering will dwindle to 1 gramme only ; the crop has therefore fallen to  $\frac{1}{25}$ th of what it was. It will fall to  $\frac{1}{200}$ th if the phosphoric acid, and to  $\frac{1}{150}$ th if the ammonia, be withdrawn. The withdrawal of the zinc would reduce the crop to  $\frac{1}{10}$ th of what it was in the complete liquid—in other words, would bring it down from 25 grammes to  $2\frac{5}{10}$ th grammes. Duclaux points out that the zinc—in weight only  $\frac{1}{50000}$ th of the fluid—increases the crop of the plant by 700 times its own weight ; and he further states that if  $\frac{1}{1600000}$ th of nitrate of silver be added to the nutritive fluid, the vegetation stops abruptly.

We learn from this that microbes require mineral food in the same way as plants and animals do, and if we knew exactly which mineral substances the tubercle bacillus requires, and could without harm to ourselves deprive our blood and cells and tissues of these salts, by abstaining from food containing them, we should deprive the bacillus of the means of existence.

The investigation of these matters, however, is very difficult. It is not easy to construct the best nutritive fluid for each microbe. It can only be obtained by a series of methodical researches. When the best artificial medium has been created, it must be

first ascertained that the result of the sowing of the spores is always uniform ; otherwise the result of the withdrawing of certain elements cannot be calculated. It is further evident that a study of agents impeding or destroying the growth may also become very important. With regard to the different articles of food, Dr. Bidder, of Berlin, points out from several papers by Dr. Bunge, of Dorpat, that the food of carnivorous animals contains a larger quantity of soda and smaller of potash than that of herbivorous animals, and he reminds us that carnivorous animals are on the whole less subject to tuberculosis than herbivorous animals. If it could be proved that the potash salts are more conducive to the growth of tubercle bacillus than soda salts, articles of food containing excessive proportions of potash ought to be taken only sparingly.

*Milk* is regarded by the majority of medical men as one of the best articles of food in the treatment of phthisis. It contains all that is required by the body, and the mineral matters in the best proportion. It is less irritating than other nourishing kinds of food, and is more easily digested. There are differences in the quality of the milk of different animals, and also of the same animal, according to the food consumed by it, and other influences ; but when merely speaking of

milk we mean cow's milk. The dangerous substances which can be introduced by it, as the fever poisons and the tubercle bacillus from cows affected by the disease, and principally those with diseased udders, are, so far as we know, destroyed by boiling. We ought therefore, unless we are perfectly sure about the milk-supply, always to recommend the milk to be boiled.

Patients often say that milk disagrees with them, but I have only rarely been obliged to acknowledge this statement as correct. In some cases where there is a tendency to diarrhœa, or sickness, or acidity of the stomach, it is necessary to dilute it with from one-third to one-tenth of lime-water, which often exercises a soothing influence on the mucous membrane of the intestinal canal, and may, besides, help to bring on the cretaceous change in caseous deposits. In other cases, especially where there is constipation, the addition of Apollinaris or natural Selters, or Bilin water, is useful ; in others that of barley-water ; in others, a small quantity of coffee, tea, or cocoa renders the milk palatable to persons who have a dislike to the taste of pure milk. In many instances the addition of rum or cognac promotes the digestibility of the milk, especially in persons accustomed to stimulating food, including much alcohol ; but this addition ought to be made only under the guidance of the doctor.

In some cases it is necessary to peptonise the milk before it is taken, and again in others to withdraw part of the caseous matter and of the cream (whey judiciously prepared); while there are, on the other hand, instances in which the addition of cream is beneficial.

Some invalids, I need scarcely remind you, digest the milk of donkeys and goats better than cow's milk.

As a modification of milk *koumiss* may be given with advantage in many cases. It is well known that *koumiss* is not a fluid of a constant chemical composition, but that it varies according to the state of fermentation; but it always contains more or less lactic acid, carbonic acid, and alcohol, is more stimulating than milk, and quenches thirst more rapidly. We have met with cases of invalids who for days and weeks could not or would not take any other article of food but *koumiss*.

The quantity of milk suitable to different invalids varies very much indeed, in the same person at different periods of the disease, and also according to the amount and quality of other food consumed. I generally advise from one-and-a-half to three pints in twenty-four hours, but many cases, especially those complicated with albuminuria, I restrict, sometimes for weeks, almost entirely to milk and milk food.

I dare not discuss other articles of food in the same way as I have done with milk. Everyone interested in dietetics will find valuable information in the works of Playfair, Frankland, Pavy, and Bauer.

About diet in general I will confine myself to some general rules. 1. To induce the individual to take as much nourishing food as his digestion permits, and to endeavour to increase the appetite and digestive powers by air and exercise, and sometimes by medicinal substances. 2. To give as much choice and variety as can be obtained. 3. To avoid articles of food, or of relish, of inferior nourishing value, if by these the appetite for more necessary articles is diminished, or the digestion of the latter is disturbed. Such articles are, for instance, acids, salads, and especially uncooked acid fruits, sugar, and pastries—a list which might be largely increased. Potatoes ought to be taken only in very moderate quantities. They contain much potash in proportion to soda, and experience shows that the exclusive or even preponderating use of potatoes favours scrofula.

I have mentioned before that in the majority of ordinary cases of phthisis, except the very chronic and arrested forms, it is better to take the desirable amount of food in frequent small meals than in two or three large ones. I am in the habit of recom-

mending a plan of the following kind, with many modifications according to circumstances :— At seven o'clock or earlier, while still in bed, a cup of milk by itself, or with a dessert or tablespoonful of cognac, or with lime-water, or with a small quantity of tea or cocoa and a small piccc of bread-and-butter. At half-past eight or nine, after dressing, breakfast of milk, with some slightly stimulating addition, as tea, coffee, or cocoa, bread-and-butter, or bacon, ham, or fish, or poultry or meat. At eleven, a tumblerful of milk or koumiss, or sometimes a cup of broth or beef-tea, or a sandwich and a glass of wine. At one or half-past one a substantial meal of meat, or poultry, or fish, or game, with fresh vegetables, some light pudding or cooked fruit, and a glass of wine. At four o'clock, a glass of milk or koumiss, or a cup of tea or coffee with much milk, and some bread-and-butter or plain biscuits. At seven another substantial meal similar to that in the middle of the day. At half-past nine or ten, on going to bed, a cup of milk, or bread-and-milk, or milk with some farinaceous food, as Hart's, Liebig's, Nestlé's, or Mellin's. At this time, especially if there are night sweats, the addition of a tablespoonful of brandy is very useful.

In cases of considerable pyrexia it would be injudicious and impossible to give as much solid food



as in chronic non-febrile or nearly non-febrile cases, but it is necessary to give as much easily digestible food as the patient can digest. Our aim ought to be somewhat to check the waste, and to replace by food the increased waste. Here alcohol is of great use. Milk is often not digested in its natural state, but it must be tried peptonised and diluted with pure water, aerated water, or, still better, with barley-water or thin gruel, or in the form of koumiss. Chicken broth, veal broth, beef-tea, and gelatinous substances are in these conditions most useful; while in health, and in the non-febrile consumptive cases, they ought not to take the place of the more solid proteinaceous substances.

In most cases of phthisis it is desirable to introduce into the system a fair amount of *fat*, and this can often be done better in the shape of bacon, fresh butter, and milk and suet, than in the form of cod-liver oil, though the latter, too, is most useful.

There are some popular 'cures' of phthisis into which milk or different kinds of fat, assisted by open air, enter largely. You all know the milk cure in the various mountain districts, from the time of the Romans to the present day; the koumiss cure in Tartary. I remember also the butter-milk cure in some German villages, and have often heard that in

the American prairies consumptive patients are cured by consuming large quantities of the bone marrow of the buffalo. Many years ago, when assistant at the *Clinic* at Bonn, two of my poor consumptive patients left me to be cured in a neighbouring village by taking three times a day or more frequently a large plateful of a kind of porridge prepared of dog's fat and rye meal, and certainly their improvement was most remarkable. But they had exchanged at the same time their indoor town work for outdoor country work. All these cures have two points in common: first, food rich in fat and proteinaceous matter; and, secondly, outdoor life.

I cannot close the chapter on food without entering into the debated question of *alcohol*. Much as I am convinced that in health alcohol is rarely necessary, in phthisis, especially in the febrile stages, experience has convinced me of its great usefulness in the majority of cases, so long as the kidneys are sound. It acts as respiratory food (Binz) and limits the waste of tissue. Brehmer, Spengler, Unger, Rüdi, Volland and Dettweiler use it largely; Austin Flint, too, is a strong advocate for its use.<sup>1</sup>

<sup>1</sup> Dr. Rohden likewise recommends alcohol in his judicious chapter on the *Treatment of Phthisis*, forming part of Braun's work on *Baths and Waters*. English edit., Smith, Elder, and Co., p. 545, 1875.

The quantity and quality required vary very much in different cases. In some cases as much as a bottle, and even three pints, of moderately strong wine, or ten to twelve ounces of cognac or whisky, are taken in twenty-four hours with advantage ; in others scarcely one-sixth of this amount ; and, again in others alcohol must be altogether avoided. Alcoholic drinks seem to be especially useful in those cases where a pretty large quantity can be taken without unpleasant excitement or headache, but where, on the contrary, a sense of comfort and increased strength is produced by them, where appetite and digestion are improved, flatulence and indigestion removed, and pyrexia, when existing, is diminished. Where, on the other hand, they cause throbbing in the arteries, headache, listlessness, flushing, or great excitement, or loss of appetite for ordinary food, they are either unsuitable or can only be taken in small quantities. The doctor must decide by careful and repeated examinations whether, and in what quantity, alcoholic drinks are to be given.

The quality, too, cannot always be known without trial. In Germany and Austria the stronger Hungarian wines are much liked ; in the Alps the red wines of the Valteline ; but Madeira, Marsala sherry, Burgundy, good claret, and some pure Italian and

Greek wines are likewise useful, and not rarely beer ; cognac and whisky suitably diluted are of great value in cases of weakness. Very often Dr. Dettweiler's plan, to give the amount of alcohol required in very frequent and small doses, is of great practical value.

2. *Air and Ventilation*.—Although it is generally acknowledged that impure air is the foremost cause of phthisis, and although Dr. Henry MacCormac, Dr. B. W. Richardson, and others have preached not only this, but also that pure air is the most important means of cure, yet we must all confess that in practice the first principles of air treatment are, with rare exceptions, most imperfectly carried out. Wherever climate permits, an entirely open-air and tent life is the best help in the treatment of phthisis ; but this is not easily practicable the whole year round in our climates, although much might be done in this direction. Fears of the inclemency of the weather are far too great amongst the public as well as the profession. Patients affected with chronic consumption, without or with only moderate and partial pyrexia, ought to spend the greater part of most days in the open air, and ought not to be deterred by a little rain, or mud, or low temperature, or by the fact that they begin to cough when they come out of the close house into the open air. Arrangements ought to be made by which

invalids are enabled, warmly dressed, to sit in the open air, sheltered from wind and rain.

It is here where the degree of intelligence of the patient forms an all-important element in the chances of success. It is necessary, as I have already stated, to give the patient and his friends an idea of the nature of the illness and the means of cure, and to obtain their intelligent, courageous, and persevering co-operation. The patient must see that though it is more difficult to carry out the open-air principles in an inclement climate, it is yet infinitely more injurious to him to shut himself up in close rooms than to use every possible moment of even an indifferent day to walk or sit in the open air. The improvement of the appetite, the digestion, and the strength, the diminution of night sweats, of restlessness, and mental depression, are in most instances so marked that the invalid after some time begins to have confidence, and to feel that his life is rendered more bearable even if no cure can be effected.

We must always bear in mind that even in the midst of large towns the air in open places, and even in the streets, is very much purer than within the houses. The researches of Angus Smith, Pettenkofer, and others have shown this with regard to the proportion of oxygen and carbonic acid and other

impurities ; and those of Miquel with regard to the number of microbes in the air at Paris manifest this in a most striking manner, their proportion within the wards of the Hôtel Dieu and of the Notre Dame de la Pitié being much larger than in the Rue Rivoli.

As, however, the greater part of the twenty-four hours is spent indoors, the arrangements of the house and of the rooms are of the greatest importance. The invalid ought to have sunny rooms, sitting- as well as bedroom, for, though the sun does not shine at night, the vivifying influence which it exercises on the air of the bedroom during the day does not disappear at once with the cessation of the sunshine, but lasts through the night and longer ; 2,000 cubic feet per head is not too much space for each inmate, and by good ventilation the air ought to be frequently renewed by day and by night. The temperature ought, if possible, never to exceed 62° F. ; and the open fire is by far the best producer of artificial warmth ; gas ought to be entirely excluded. The bed ought to be open on all sides, and the ordinary consumptive invalid ought not to be longer than eight or nine hours in bed, even if the body temperature is somewhat raised during some hours of the day. It is a horrible custom to keep such invalids during the greater part of the day in bed unless the weakness be

extreme. In all diseases it would be a useful subject of discussion—when a patient is to be in bed and when not, when he is to take exercise and when to sit or lie still. But in phthisis the long stay in bed, and particularly in the bedroom, is certainly injurious; breathing, ventilation of the lungs, circulation, appetite, tissue-change, almost everything is unfavourably influenced.

In acute forms and stages of phthisis, when there is much fever, I do not advise the patient to take active exercise, or to fatigue himself by sitting up during any length of time; but it is certain that pure and fresh air is as necessary, and even more so, than during the non-febrile stages. The bed of the patient ought therefore to be placed so that he receives as much open air as possible without exposure to actual wind or draught. In summer, and also in winter, weather permitting, a couch or bed ought to be placed on a balcony or terrace, or in an open field or garden; the patient ought to be carried to it and, properly covered, lay there from morning to night, or as long as possible. Some of my patients have spent, during weeks, or even months, a great part of the day in hammocks slung up between trees, with great advantage. The change from the ordinary bed treatment in a close room to this open-air couch or hammock

treatment is an infinite gain to the patient, who breathes more, eats better, is more cheerful, sleeps more soundly, and is less troubled with perspiration. The pyrexia, likewise, often rapidly decreases.

I shrink at present from touching the open-air treatment of the poor at their homes, except so far as they likewise should be taught to be as much as possible in the open air, and to sleep with open windows ; and I may add that I have seen many instances where a change to open-air occupation in all weathers, from indoor work in close workshops or bakehouses, has led to an arrest of disease and recovery. I must enter, however, a little more fully into the treatment of poor consumptive patients in our general hospitals situated in large towns. There they have usually only between 800 and 1,200 cubic feet of air per head, with ventilation through open windows, which cannot be efficiently carried out without draught, and is in winter often sadly neglected. The majority of these patients, even if there is only moderate and partial pyrexia, spend the whole or by far the greater part of every day in bed, which, as I have already said, ought not to be, excepting in acute cases or stages, or in excessive weakness ; but if, after the subsidence of the pyrexia, they are out of bed, standing, or sitting, or walking about in the wards, they are exposed to



draughts, and frequently contract fresh attacks of bronchitis or pleurisy, or other illnesses due to chill, and thus take further steps in their downward course.

Although I have always been fond of hospital work, these considerations have been for a long time a source of worry to me whenever I stood at the bedside of my consumptive patients, and in despair I have more than once said that they were in the worst place in the world ; and yet the hospital to which I am attached stands on an open spot at Dalston, and has small plots of ground attached to it where convalescents can sit and walk, while the hospitals in the interior of London are mostly deprived of this advantage. This is, indeed, a subject, gentlemen, which deserves your serious thought, and I earnestly entreat you, if you agree with me, to enlighten the public and to use your influence to procure better accommodation for the treatment of the consumptive patients of the poorer classes.

I know that many medical men, and perhaps some of those whom I have the honour of addressing, are not in favour of special hospitals. If the general hospitals are well arranged for the treatment of phthisis, and situated in good air, some of my objections fall to the ground, but these favourable conditions are rarely met with. Very much better are the arrange-

ments in the Brompton Hospital for Consumption, especially in the new building, which I had the advantage of seeing quite recently with Dr. Theodore Williams. Each of the three floors devoted to in-patients consists of a corridor 10ft. in width, a large central dining-room, ten wards  $13\frac{1}{2}$ ft. high, holding from one to eight beds—forty-six in all. The average floor space per bed is 115ft., the cubic space being 1,400ft. The ventilation is maintained independently of the windows and fireplaces and supplies 4,000 cubic feet per hour to each patient. The air is admitted by numerous openings placed on a level with different floors—on the east and north into the galleries, on the west and south into the wards, the greater portion being heated by passing over coils of hot-water pipes ; a part is admitted directly. The quantity of hot and cold air can be modified at will, and the temperature is capable of being evenly maintained. The foul air is drawn off from the corridors, wards, &c., through extracting flues built in the walls, and furnished with openings at floor and ceiling. These flues run into large air-ducts beneath the roof, which communicate with four towers heated by steam coils, forming the exhausting chambers.

With these arrangements it is possible for patients to walk about in the corridors, or to sit in the

central hall and converse with one another without being exposed to draughts and chills. It was a great pleasure to see almost all the patients out of bed. The drawbacks unavoidable with the situation in London, especially with the east and north-east winds, are the ordinary contamination of the air and the occasional fogs, and the fair results obtained show how much good can be done by judicious treatment and arrangement in spite of such a grave natural defect.

Infinitely more advantageous is the situation of the National Hospital for Consumption at Ventnor, with which I have been acquainted for many years past, and which I have lately again visited, under the guidance of Drs. Coghill and Robertson. The Undercliff is so well known to you that I need not give a description of the delightful and healthy situation. The peculiarities of the arrangement are, you know, that the whole hospital is built in blocks for twelve patients each, that each patient has a separate sleeping-room of from 1,500 to 1,750 cubic feet, and in the newest block 2,000; that each six patients have a separate sitting-room, 3,000 cubic feet space, and each block (twelve patients) has an additional room in which breakfast, tea, and supper are served, of 3,000 cubic feet; that male and female patients dine separately in large rooms at the end of the blocks. There are

various arrangements for the renewal of air, which, though they would be regarded as satisfactory in other hospitals, have not appeared so to the authorities of the institution, so that in the new block, on Dr. De Chaumont's recommendation, a supply of 5,000 cubic feet of fresh air per head per hour has been adopted, and the fresh air is to be delivered at a temperature of 62° F. Dr. Hassall has rendered a great service to the public and the profession by originating the foundation of this hospital. Between the hospital and the sea there is a large piece of open ground for exercise and sitting in the open air. The diet of the patients is well arranged; the results of the treatment are satisfactory, and the patients are mostly very happy during their stay.

What I should like to add are terraces and balconies on which light beds or couches could be placed for febrile patients to lie on, and thus to enjoy the open air; and, further, large verandahs, glass covered, and with movable glass doors, to be opened and closed at will, so that patients might sit and walk there during wet and windy weather. Further useful additions would be seats with shelter overhead and on three sides, turnable so that the shelter might be turned against the wind, and the patients sit there with the whole front open, even in

rain and windy weather. I should also be inclined to erect in suitable places walls with reflecting surfaces, to serve as shelter from wind and as reflectors of the sun's warming rays. Hammocks would be at times likewise a comfort.

There are, also, small sanatoria for consumptive patients at Bournemouth and Torquay ; but the number of beds added together is almost infinitesimal compared with the number of consumptive patients belonging to the poorer classes. If there were a hundred of such hospitals they would be a fair instalment of what is required to meet the most necessary wants. I should not recommend large hospitals, but small ones, for eighty or a hundred beds, with from one to three or four patients in each room ; with balconies to hold one bed, so that one febrile patient could be moved into the open air, and more than one such ought never to be in the room. There should be large verandahs for exercise and sitting in wet and windy weather, shady and sunny seats, seats such as roughly sketched above, with turnable shelter to be used in windy and wet weather ; and in other respects arrangements similar to those at Ventnor and Brompton.

Each hospital ought to have a resident medical officer, and there ought to be ample room for exercise

on level as well as on rising ground. They ought to be in the country or at the seaside, on account of the greater purity of the air ; and the neighbourhood of pine forests would be an additional advantage. Even in the suburbs the air is much purer than in the interior of towns ; thus Miquel found in ten cubic inches of the air of Montsouri (a suburb of Paris) 7,600 microbes ; in the Rue Rivoli (in the centre of Paris) 55,000 ; and a still much larger number, as already stated, in the hospital wards, especially in the winter. It would not be difficult to find fairly suitable localities. Surrey, Kent, Berkshire, and Hampshire have good sites. On the southern slopes of their pine-clad hills—for instance, between Leith Hill and Ewhurst Windmill ; between East Grinstead, Frant, Wadhurst, and Ticehurst ; between Ripley and Cobham ; on the Chobham ridges ; between Farnborough, Minley, Bramshill Park and Eversley ; near Haslemere, on the slopes of Black Down and Hind Head. The south-west, south, and south-east coasts offer likewise some fair localities, if care is taken in the selection of the spot with regard to shelter, dryness of soil, and exercise ground. The Undercliff, for instance, and the neighbourhood of Bournemouth still possess some not yet overcrowded sites ; also Torquay, Sidmouth, Lyme Regis, Dawlish, Hastings ; and on the coast of

North Devon and Cornwall and near Llandudno and in Bute good spots could be found.<sup>1</sup>

I know, gentlemen, that small hospitals for consumption such as I have suggested are expensive, and that it would be difficult to find the money ; but if you are convinced of the advantage to the patients, and will use your influence, donations and legacies will come in, and in the course of time we shall take a step in the right direction.

3. *Exercise*.—Exercise is one of the most powerful and essential means of cure. It is as necessary as air and food, because it enables the invalid to take both in a sufficient quantity to improve the nutrition by taking up fresh material and removing the waste, and thus to fight a battle with a fair chance of success. Without exercise I should not like to treat phthisis. To take exercise properly requires, however, the guiding hand of the physician ; there are judicious persons who can be taught to become sufficiently acquainted with their entire condition and their surroundings to enable them to do neither too much nor too little, but such persons are rare amongst consumptive invalids. In many of them the nutrition of the

<sup>1</sup> More hardy or arrested cases do very well on fairly exposed dry cliffs at the seaside. On the cliff at Folkestone, for instance, several consumptive patients of my own acquaintance have taken up their abodes with great advantage, and Dr. Bowles has told me of several other cases.

brain has suffered as much as that of the stomach and lungs and other systems, and their judgment with regard to their own state and their wants is impaired.

We ought, therefore, to bear in mind that by far the majority of those suffering from phthisis require constantly to be held by 'leading reins,' and must be told what kind of exercise to take, how much, and at what times. Walking on level, climbing gently, and with measured increase as to duration and steepness, riding on horseback, skating, and tobogganing are all useful exercises under guidance ; but over-exertion ought to be carefully avoided, and one mistake often destroys the fruit of months and years of judicious management. Up to a certain point the sense of fatigue is a guide, but not always, for some persons feel fatigue at the beginning of a walk and improve while taking it, and others never acknowledge to themselves the sense of fatigue. The medical man alone can measure the amount of strength, and how it can be maintained and increased by gradually increasing exercise. The manner in which the heart, the pulse, the skin, the appetite, the sleep, and other organs are influenced by different kinds and by the amount of exercise must guide the physician in his advice as to these important points.

Climbing is especially useful, as it brings the



whole systems of circulation and respiration into play, and leads to expansion of the lungs and thorax and strengthening of the respiratory muscles. Regulated climbing for a course of weeks and months in suitable cases has a wonderful effect on every organ and function of the body ; not only respiration and circulation, but the digestion, the action of the skin, sleep, mental power, resistance to changes of temperature, all show the beneficial effect ; and we may infer that this is due to an improvement of Beale's bioplasm, or 'living matter,' in the cells.

Riding on horseback is likewise excellent exercise, exhilarating and accelerating the circulation, and through this the respiration ; and it has been the principal means of treatment in several cases of recovery under my observation (Sydenham).<sup>1</sup> Riding on donkeys may, in some localities, be substituted for

<sup>1</sup> Sydenham had so high an opinion of the beneficial influence of riding in consumption, that he thought it a greater remedy in this disease than even in hypochondriasis : 'though riding has done well in hypochondriasis and other distempers, yet it does better in a phthisic than in any other case.' Sydenham speaks, however, not of riding in a close school, but 'in a good air,' and especially of travelling on horseback, and he wants the patient to persist in the exercise and visit different parts of the country, 'and provided also that besides his (the patient's) persisting in riding, he go into new places, for the change of air and diet do so considerably add to the cure as the exercise itself.'—The *Works* of Thomas Sydenham, M.D., Sydenham Society, 1851 vol. ii. p. 331. The value of this note will be enhanced when I add that it is due to the suggestion of my friend Dr. Handfield-Jones.

horse exercise. Tricycling is likewise useful to some invalids. Pulmonary gymnastics—i.e. a methodical deep inspiration, followed, after a pause, by full expiration, practised in pure air several times a day are very useful in chronic non-febrile cases. Well-arranged exercises of the upper extremities materially assist the expansion of the apices and the subclavicular regions. Where active exercise is impossible from great weakness or forbidden from inflammatory complications, the movement in a Bath-chair is especially to be recommended, and by turning the head against the wind it can be used in almost all weathers.

Open carriage exercise is likewise good, but there ought to be very little wind, or some arrangement for sheltering from the wind, by having, for instance, the front hood up, and sitting with the back to the horses, which can be well arranged in landaus. Those who have the chance of being moved in a boat up and down a river, or on calm days on the sea, often derive great benefit from this mode of motion. In some cases under my observation well-arranged journeys, in agreeable company, in rowing-boats or small yachts, or steamers up the Thames, the Rhine, the Main, the Neckar, the Danube, the Isar, the Seine, and Meuse, have had very beneficial effects on body as

well as mind, and the latter ought never to be forgotten in phthisis.

In some very chronic cases of nerve-prostration, with inability to walk and to take food in sufficient quantity, massage can with advantage take the place of active exercise, being a powerful accelerator of tissue-change, and leading to increased breathing and improved circulation. I have as yet had only a few cases in which I have recommended a plan somewhat analogous to that of Weir Mitchell and Playfair, though very much less energetic, but with evident advantage on the nutrition, muscular and mental energy. It appears to me, so far as my experience goes, that there should be no active lung-symptoms. The open-air treatment has been combined in those cases with massage, the patients having been placed during a greater part of the day on couches on the balcony, or in the garden. Walking exercise was not allowed during the first part of the massage treatment, but was gradually substituted for it.

4. *Strengthening of the Skin.*—Weakness of the skin is one of the prominent features as well in the tendency to phthisis as also in the developed disease, and ought always to be taken into consideration and remedied if possible. A slight change of external temperature, or exposure to a slight draught or

change of clothing, is apt to produce chill, which by reflex action is thrown on the lungs ; it is also a frequent source of bronchitis and catarrh of the lungs, and also of digestive derangements, and a great obstacle to recovery in phthisis. Constant exposure to the open air and exercise are the best tonics for the skin, and often suffice by themselves ; but in many cases these must be combined or preceded by the judicious use of hydrotherapeutics.

The skin has never been altogether neglected in England either by medical men or the public, while on the Continent the neglect has been incredible, and is still so in many localities ; hence systematic hydrotherapeutics have had their origin on the Continent ; and in the treatment of phthisis, too, Brehmer was the first to introduce them, with special modifications,—viz. powerful cold douches to the chest, of very short duration. Unger, Spengler, Dettweiler, and others have continued and modified this system ; Jaccoud, Sée, and other French physicians are powerful advocates for hydrotherapeutics. Much benefit is, no doubt, obtained by well-adopted procedures, but they require most careful management by the medical man. Even the ordinary treatment of the skin in itself ought to be guided by the doctor, who will not only examine the state of the skin, but also the con-

dition of the heart and circulation in all its bearings. The degree of reactive power must be cautiously appreciated and gradually raised.

In great weakness dry rubbing by an attendant of one part of the body after another is all that can be done ; then rubbing the chest with a moist towel, and dry rubbing afterwards. Later on a very rapid sponging with tepid, and again later with cold water, followed by a short return to bed and a light warm breakfast. It requires a considerable degree of reactive force to bear with advantage on rising in the morning the sponging of the whole body by cool or cold water, followed by brisk friction as daily practised by the majority of us in health, and forcibly recommended by J. Henry Bennet, whose views on the hygiene of phthisis have exercised good influence. A rapid plunge into cold water is in many cases of fair reaction the best plan ; in others a very short shower bath, and, again, in others a hot or a tepid bath for a couple of minutes, followed by a momentary cold shower or plunge into cold water.

Many sound hints on bathing and on the management of the skin may be gathered from Mr. Malcolm Morris, the editor of the '*Book of Health*,' in his article on the skin.<sup>1</sup> Although by this means

<sup>1</sup> *The Book of Health*, p. 863. Cassell & Co., 1883.

the skin becomes strengthened, yet the invalid ought never to neglect woollen clothing from head to foot. He ought not to overload himself with heavy garments while walking or riding, but he ought to have plenty of warm wraps when he sits down or takes passive exercise. The influence of dress on health has been well discussed in a paper by Mr. F. Treves in the 'Book of Health,'<sup>1</sup> and Pettenkofer's little book, translated into English by A. Hess, is full of useful information.

<sup>1</sup> L.C., p. 461.

## LECTURE III.

5. Climates—Purity of air the most important element—Floating matters—Climates of elevated regions—Objections met—General characters—Physiological and therapeutical actions—Swiss Alps—Peruvian Andes—Rocky Mountains—South African highlands—Home climates.

MR. PRESIDENT AND GENTLEMEN,—It is difficult to say anything new on the treatment of phthisis by *climate*, as the literature on the subject is rich in good articles. I need only mention the names of Sir James Clark, Walshe, J. E. Pollock, King Chambers, J. H. Bennet, C. J. B. Williams and C. Theodore Williams, A. A. Waters, Thorowgood, F. and P. Niemeyer, Rohden, Frankland, Jaccoud, Biermann, Thilenius, H. Hassall, Sée, Symes Thompson, Marcet, Clifford Allbutt, Burney Yeo, Sparks, Denison, Solly, and Tyndale. The remarks which I am going to make can only be very fragmentary.

The difference between different cases of phthisis is so great that it is impossible to lay down fixed rules for climatic treatment. In deciding between

the numerous climates and localities, the circumstances connected with the ætiology, the stage of the disease, the amount of destruction, and the complications with diseases of other organs are very important, but still more so the distinction between a weak and a strong constitution, an excitable or a torpid nature—between progressive and retrogressive, active or stationary, cases. Mental peculiarities, too, ought not to be overlooked; nor the habits of the invalid and the circumstances in which he has lived.

Unlike, however, as different invalids are in these and other points, in all of them we must bear in mind that we have to deal with raw and ulcerated surfaces in the respiratory passages,—surfaces which in most cases, at all events, are infected by a specific microbe, and are very susceptible to all impurities of the atmosphere, and especially to the microbe element, which abounds wherever organic decomposition, and particularly putrefaction, takes place, and wherever there are congregations of human beings and animals in shut-up localities.

Hence it is clear that *purity* or an *aseptic state* of the air is the first demand which we ought to make on the climates to which we send persons affected with phthisis. Temperature, the degree of moisture, atmospheric pressure, light and sunshine,



electricity, wind, frequency or absence of rain and snow, nature of soil, elevation above the plain or the sea, which in their varying combinations form the different climates, are each and all important agents in the climatic treatment, as I have endeavoured to show elsewhere ; but none is so essential to the consumptive patient as the purity of the atmosphere. After what I have said before on the necessity of pure air and its renewal in rooms, it is scarcely necessary to add here that in every climate the position and the internal arrangements of the house, and particularly of the rooms in which the invalid is to live, are as important as the character of the climate of the place.

In former years the composition of the air in its influence on health was judged principally by the amount of oxygen, nitrogen, carbonic acid, ammonia, and water ; but of late attention has been forcibly directed to the amount of *floating matter* in the air by Ehrenberg, Pasteur, Tyndall, Maddox, and others ; and a great accession to our knowledge and a fuller appreciation of the influence of the atmosphere has been obtained by the interesting labours of Miquel at the Observatoire de Montsouris, near Paris, to which Professor Sée has directed my attention, and the result of which has been mentioned by Dr. Poore in

his Cantor lectures, already alluded to. Miquel gives us the following interesting table of the number of bacteria found in ten cubic metres of air taken as nearly as possible at the same time in July 1883 :—

1. At an elevation of from 2,000 to 4,000 metres .	None
2. On the lake of Thun (560 metres) . . .	8·0
3. Near the Hôtel Bellevue, Thun (560 metres) .	25·0
4. In a room of the Hôtel Bellevue . . .	600·0
5. In the Park of Montsouris, near Paris . .	7,600·0
6. In Paris itself (Rue de Rivoli) . . .	55,000·0

This table shows clearly, as I have already pointed out, the difference not only between a high and low elevation and between town and suburb, but also between indoor and outdoor air, the air in a room of the Hôtel Bellevue containing twenty-four times as many microbes as the air in the grounds outside. The difference between the air on the lake of Thun (8·0) and on the shore—i.e. the grounds of the Hôtel Bellevue (25·0)—is likewise significant ; and the low rate on the former may be ascribed to the distance from the sources of organic decomposition. We may reasonably infer that a still greater rarity of microbes will be found in the air on high sea. Similar researches into the purity of the air are being energetically pursued at Berlin, but I am not yet acquainted with the result.

Another point of consideration is, How far do

climates and health-resorts assist the invalid in improving the general nutrition and power of resistance? This depends to a great degree on their enabling the invalid to be much in the open air and take active exercise without risk of chills and consequent complications. Not all the climates, however, which allow the invalid to be much in the open air are at the same time conducive to active exercise. Some are apt to produce a feeling of languor and diminished inclination for food, while others raise the nervous system, improve the appetite, digestion, sanguification, and muscular energy, and facilitate the elimination of used-up matter.

We may, in some points, compare climates with medicines. There are such medicines, as morphia, which soothe the cough and procure sleep, but check the appetite and nutrition in many people. Antipyrin has a wonderful power in subduing pyrexia, but in almost all my trials of its effect on the pyrexia of consumptive patients it has entirely suppressed the appetite. Such medicines ought, therefore, to be avoided in the majority of hopeful cases of phthisis, because the improvement of the nutrition is the first demand. So there are agreeable climates which soothe the cough, but diminish the appetite and the inclination to take exercise, and can therefore be

recommended only in exceptional cases. On the other hand, bitter remedies and tonics do not soothe the cough ; but if they improve the appetite they often exercise a beneficial influence on the course of phthisis. In the same way cold does not soothe cough, but, on the contrary, sometimes produces it at first ; but if it improves the appetite of the consumptive person and enables him to take more exercise, it improves the nutrition, and thus exercises a beneficial influence on the course of phthisis.

The consideration of such qualities of climate is all-important in the treatment of phthisis, though these characters are not shown by meteorological tables, however carefully prepared ; they must be learned from personal observation and from carefully watching invalids and their healthy companions. In these points lies the difference between what are popularly called relaxing and bracing climates. We will not, however, disregard meteorological tables and descriptions, for from these we often learn important facts about the nature and strength of wind, the frequency of mist and rain, the conditions of temperature, the degree of humidity, the amount of sunshine, so that we can avoid sunless and depressing climates, with frequent cold wind, mist, rain, and drizzle, which prevent invalids from taking a

sufficiency of outdoor exercise. Unsatisfactory, however, as these influences are, there are others to be much more dreaded, as crowding together of many human beings, stagnation of air, presence of decaying substances, organic dust, lowness of situation, and dampness of soil (Bowditch and Buchanan).

Many people still cling to the idea that cold is injurious and warmth curative in phthisis, but this idea is quite incorrect. Another idea, that equable climates are the best in the treatment of phthisis, should likewise be much restricted. The most important point of all good climates in phthisis, as I have said before, is purity of air. This is to be found, first, on elevated regions ; second, in the desert ; third, on the sea. The first two are usually considered under the great division of inland climates, the third under marine climates. In rapidly glancing over these divisions I shall have the opportunity of mentioning some other localities which are used as health-resorts in phthisis, although they cannot claim pure air, or air of an aseptic character, as one of their prominent features.

Allow me, gentlemen, to begin with the climates of elevated regions (altitude or mountain climates), which only in comparatively recent times have come into favour in Europe, although they were used in

Peru at an earlier period (Archibald Smith). They were somewhat roughly treated in the beginning. A justly-esteemed author on diseases of the lungs, for instance, in 1871 calls the plan of treating consumptive patients by long residence in the Alps 'a startling quasi-sensational novelty in climatic therapeutics' in reference to a paper of mine 'On the Treatment of Phthisis by Prolonged Residence in Elevated Regions' in the Medical and Chirurgical Transactions of 1869. In further discussing this plan the same author speaks of the winter in an 'elevated site in Switzerland' as a sojourn 'amid mist, fog, damp, the fiercest cold, frost, ice, and snow.' Surely, great physician though he is, he is somewhat misinformed on this subject, and has not himself visited the High Alps during winter, but has possibly formed his impressions from a writer who practised during winter in Southern Italy. I shall discuss the author's objections *seriatim*, as this will show the character of the climate.

1. The 'mist' and 'fog' amid which he imagines the patient to be during winter in the High Alps exist, indeed, only in imagination. They are at all events excessively rare in those high valleys in winter, and when Zurich, Berne, and Basle are for days together wrapped in dense mist the sky is most blue

in the High Alps, and the air perfectly transparent and transcalent. M. Billwiller, the head of the Meteorological Department in Switzerland, has quite lately organised a system of recording sunshine at different meteorological stations, and I have, by chance, before me the comparison between Zurich and Davos during the months of last November and January (having mislaid the number for December). At Zurich the amount of sunshine during the month of November was  $48\frac{1}{2}$  hours, or an average per day of 1 hour  $36\frac{1}{2}$  minutes; ditto at Davos, 128 hours, or 4 hours 16 minutes per day. During the month of January at Zurich the recorded sunshine was 37 hours, or 1 hour 11 minutes per day; the same at Davos, 137·8 hours, or  $4\frac{3}{4}$  hours per day.

All those authors who are thoroughly acquainted with the winter in the Alps,—as Spengler, Waters, Frankland, Ludwig, Volland, Addington, Symonds, Theodore Williams, and Jaccoud, amongst others,—have described the absence of mist and the abundance of sunshine, and it is only a corroboration of their statements when I add, that while at Zurich and in the whole of the lower regions of Switzerland a thick mist entirely shut out the rays of the sun from the 18th to the 27th of January last 6 hours of sunshine were registered daily at Davos, and what kind

of sunshine this is the dwellers in the lower regions who have never been in the High Alps during winter can scarcely imagine.

At the end of November 1869, I spent on the Piz Languard, about 10,700 feet above sea-level, and on an ice pyramid of the Morteratsch glacier (about 9,700 feet) more than  $1\frac{1}{2}$  hours on two consecutive days without an overcoat. As long as I remained in the sun, I never felt warmer in August and September at the same localities, but in the shade an overcoat would have been just a comfort, though I did not feel actually cold in spite of a temperature of only  $20^{\circ}$  to  $25^{\circ}$  F., the air being perfectly calm. A black bulb thermometer *in vacuo* showed in the sun between  $88^{\circ}$  and  $92^{\circ}$  F., while an ordinary thermometer showed only between  $31^{\circ}$  and  $32^{\circ}$  F., and the exhaled breath became rapidly condensed. This shows that the air itself was only slightly heated by the sun's rays, though the body covered with woollen clothes had all the benefit of the warming rays. I specially mention this difference between the black bulb and the ordinary thermometer because it shows that the air inhaled is cold, to which point I shall later return. During these two days a dense mist prevailed in the lower part of Switzerland and Upper Italy.



2. How can the author call the air '*damp*,' and how has he obtained this notion? Dr. Frankland speaks of the 'excessive dryness of the air at Davos,' and further on says, 'The absence of suspended watery particles in the air has, no doubt, very considerable influence in preventing the chilling of the skin. I need only mention the facts that air at a low temperature can hold only a very small quantity of watery vapour, and that if that small maximum is reached the vapour must become condensed in the shape of mist or fog, the rarity of which I have already mentioned; and the usual transparency and translucency show likewise that the quantity of suspended vapour can be only very small. All the authors agree on this point, and Dr. Volland and Mr. Waters have further pointed out that also the air in the rooms is very dry, indeed even drier than out of doors. Mr. Waters found the relative humidity in his bedroom at Davos during the winter of 1881-82 varying from 25° to 35°; the temperature of the room being about 60° F. with an open window at night.

3. 'The fiercest cold and frost' of which our author speaks is scarcely felt by the patients at Davos or St. Moritz; Spengler, Waters, Frankland, Unger, A. Symonds, Theodore Williams, Ludwig, Rohden, Peters, and myself, as well as many others, have often

discussed this question. The main points which prevent the cold being much felt are: (1) that the air is dry; (2) that it is calm; and (3) that the sun-heat is very great.

In an excellent article in a recent number of the 'Practitioner' on Winter Health Resorts the same question is discussed. 'The temperature of the human body depends very much on the dryness of the air. A Canadian feels it much colder at  $4^{\circ}$  below freezing-point in London than in Canada when the thermometer stood at  $40^{\circ}$  below zero. The dryness of the air in Canada more than compensates for a difference of  $68^{\circ}$ . Dry air has very little capacity for heat, so that when it is at rest it conducts away very little heat from the body.'

Wind changes the matter very considerably; but wind, as I have said, is rare during winter in the chief Alpine health-resorts; partly through the shelter of the mountains, partly through the absence of local winds, as every place is covered with snow. In summer there is much more wind, and it is then often very disagreeable, and, unless care is taken, chilling; but it is not so injurious as it would be in winter. I have spoken already of the great sun-heat, and the papers of Waters, Frankland, and others are well known. The result of this sunshine and absence of

wind is, that even rather delicate invalids can sit for many hours lightly covered on open terraces and in verandahs, or on seats, along the southern slopes of the mountains or round the ice-rink ; that they can frequently drive in sledges and take short walks ; while the hardier ones can join in long excursions, in skating, and tobogganning. The time passes quickly, and the majority of invalids manage to be more in the open air than on the Riviera.

Is the calm dry cold of the Alpine winter health-resorts injurious ? My answer is decidedly, No. It is not only not injurious, but beneficial to all those who are suited to this climate. When warmly dressed, the invalids who are able to walk can be out, even if there is no sun, provided there is no strong cold wind, and the majority of them can with reasonable precautions in dressing even walk on calm evenings. The danger of becoming chilled at the time of sunset is far less than in the Riviera climates. It is only a remnant of our old prejudice which can make us afraid of dry, calm, moderate cold.

A consumptive patient is in a better condition for recovery if he lies on a couch in a judiciously selected spot in the open air even in winter than in a shut-up room. The low temperature of the air has the obvious advantage that the bacillus and other microbes

cannot thrive in it, and that putrefaction is arrested. In addition to this, the low temperature of the inhaled air leads to loss of heat, and of a large amount of water. This, I presume, acts as well in an antiphlogistic as in an antiseptic way; and it may arrest the disease by drying up ulcerated spots and by checking the thriving of the bacillus within the lungs. The diminution of the expectoration observed in many cases is partly due to it, and perhaps also that of the night perspiration. The pulmonary circulation becomes increased, in order to supply the water lost, and the energy of the right heart, and of the cells and tissues of the lungs, must be likewise favourably influenced. The respiratory thoracic movements cannot escape being rendered more active, and, through this expansion of the thorax, strengthening the thoracic muscles and helping all the respiratory acts. It is not too much to say that a great part of the favourable influence of the winter climate of the High Alps takes place through the increased inhalation of this cold, dry, pure, and rarefied air.

4. I fully acknowledge the author's correctness with regard to '*ice*' and '*snow*' in the winter climate of the High Alps, but with this I find as little fault as with the calm cold air. Indeed they are almost inseparable, for the ice and snow which cover the ground

prevent dust and decay, and the microbe-laden emanations from the soil. The calmness of the air, the absence of local winds ('Thal' and 'Berg' winds), are in great part due to the ground being covered with ice and snow ; furthermore, where the roads are for months together covered with snow, the invalid can walk on them without the danger of wet feet, and the healthful exercises of sledging, tobogganning, and skating for the more hardy invalids and their companions are certainly not to be despised.

After having discussed the bad character of our author's Alpine winter, I must devote a few minutes to the purity and rarefaction of the air. The purity, or aseptic character, is intimately connected with the cold, ice, and snow, and also with the sparseness of population and industries. To this point, and particularly to the comparative absence of spores, I had always been inclined to ascribe the favourable influence of residence at high elevations on phthisis ; and when Professor Tyndall in 1868 directed my attention to Pasteur's researches, published in 1862, I became strengthened in this view, which I mentioned at the Medical and Chirurgical Society in 1869. The facts published by Miquel, and already quoted above, as to the absence of microbes in the Alps at localities above 2,000 metres, strikingly show the purity of the air. I am

not, however, blind to the fact that wherever a large number of human beings, especially invalids, congregate, there the purity of the air is likely to be impaired.

The rarefaction or rarity of the air, with which its lightness or diminution of pressure is intimately associated, has been the subject of many theories ; for instance, as causing a starvation of oxygen and the peculiar kind of mountain anæmia, of the existence of which, however, I have not been able to convince myself in the Alps. What seems to be certain is that more blood flows to the surface of the skin, that this organ becomes better nourished, that internal organs become in proportion somewhat unloaded, and, further, that the separation of carbonic acid from the blood in the lungs is facilitated (Marcet and Chermond). I am less certain with regard to the view that a diminished quantity of oxygen contained in a given quantity of air leads to the inspiration of a larger volume of air, and through this to a greater expansion of the lungs and thorax. This theory has been quite lately expounded in a very plausible way by Professor Jaccoud, a great advocate of the curative effect of Alpine climates, in his valuable work on phthisis, of which a good English edition by Dr. Lubboek has just been published.

I am not prepared to say that this view is incorrect but, as I have pointed out already in 1869, and in later communications on the subject, the experiments of Frankland and Tyndall on the burning of candles on the top of Mont Blanc and at Chamounix show that, although the light-giving power of the flame is much less on the top of Mont Blanc, the quantity of stearine consumed, or, in other words, the energy of combustion, is almost precisely the same as at Chamounix. This remarkable result is ascribed by the authors of the experiment to the greater mobility of the atoms in the rarefied air, 'making atonement for the smallness of their number by the promptness of their action.' I can corroborate the experience of Dr. Theodore Williams regarding the increase of the circumference of the thorax, and especially of the diseased side of the chest in several of those cases which have shown a satisfactory progress. I am not, however, sure that this is due to the rarity of the oxygen, as the inhalation of the dry cold air already accounts for it. Whether the thinner air of high regions is unable to hold the microbes floating, and whether in this way rarefaction is a source of purity, as Miquel seems to think, I am not able to say ; but this point could, I should think, be settled by experiment.

I must deny myself the pleasure of further entering

into the details of the peculiarities of mountain air and mountain health-resorts. The main physical features important to us are :—1. The purity or aseptic nature ; the comparative absence of floating matter. 2. Dryness of the air and soil ; comparative absence of mist. 3. The coldness or coolness of the air temperature and the great warmth of the sun temperature. 4. The rarefaction and low pressure of the air. 5. The intensity of the light. 6. The stillness of the air in winter. 7. A large amount of ozone. The effects on the invalid suited to such climates are : increase of appetite, improvement of sanguification and general nutrition, strengthening of the heart and circulation, raising of muscular and nervous energy and of activity of the skin. Under the influence of such constitutional progress, which is assisted by the local action of the aseptic dry and cold air, by increased ventilation of the lungs, and by compression of the diseased parts through healthy and emphysematous dilatation of the surrounding tissue, we observe a gradual improvement in the state of the lungs leading not rarely to arrest of the disease and actual cure.

*Duration of stay, and season of the year.*—The time during which an invalid ought to stay in elevated regions varies greatly, according to the nature of the



case, from four and six months to as many years, and general rules can scarcely be laid down. He ought to remain until he is cured, or until it is seen that the climate does not suit him. An additional advantage of these climates is that the majority of patients can remain throughout a whole year, with occasional changes to allied, not to distant, localities.

The winter season is the best in the Alps ; spring is the time of general melting of the snow, and soil and air are damper than in winter, so that there is more risk of chills and possibly of microbic infection than in winter, but this risk is not greater than in lower regions, where the air at the same time is more relaxing. The descent to lower regions ought therefore not to be the rule, as it is at present, but the exception, and this only after careful consideration, and with all due precautions as to travelling, selection of locality, rooms, &c.

In summer it is desirable to select mountain places which are rich in pine forests, in order to have shade from the sun and the additional benefit of the exhalation of the pines. The first part of autumn is very good, while the second forms the transition stage to winter, and is often unfriendly. Where it can be arranged, the stay in the European Alps ought to commence in August or the beginning of September,

in order that the acclimatisation can take place before the changeable transition stage begins.

You will ask me which elevation is required to bestow on a locality the character of a mountain climate. This varies greatly according to the degree of latitude, distance from the sea, and other circumstances on which I cannot enter at present. The character of the vegetation is to some degree a good criterion. In the flat regions of Northern Germany an elevation of 1,500 feet is sufficient to produce a vegetation which somewhat resembles that of the Swiss Alps at an elevation of nearly 5,000 feet, and of the Peruvian Andes at 10,000 or 11,000. The isothermal lines are likewise a help in this question. We may perhaps say, but only roughly, that in Europe north of  $50^{\circ}$  an elevation of about 1,600 feet has already some characteristics of mountain climates ; while between  $50^{\circ}$  and  $48^{\circ}$  latitude about 1,700 feet to 2,500 feet are required ; and between  $47^{\circ}$  and  $46^{\circ}$  latitude from 3,000 to 5,000 feet.

I need, however, scarcely tell you that I think that not all the climatic characters of a mountainous region in North Germany or Northern France at an elevation of 1,600 to 2,000 feet are the same as those of 5,000 to 6,000 feet in the Swiss Alps. The average air temperatures may be similar, and also the time during

which the ground is covered with snow, but the rarefaction of the air must be less great at the lower elevations. The air is heavier, the light and sun-heat are less intense, and the moisture is mostly greater. About the microbes I am not sure ; their distribution is likely to be unequal ; but where there are only few human habitations, and few sources of organic decay and putrefaction, where the soil is dry, and especially where it consists of granite and gneiss, with absence of stagnating water, there the microbe element will probably be scantily represented.

From what I have said you will expect me to recommend altitude climates in hereditary and acquired tendency to phthisis, and especially in cases with imperfect expansion of the thorax and the so-called 'phthisical habitus' ; and further, in all conditions comprised by the term phthisis, excepting those which I must describe as non-suitable,—viz. (1) consumptive patients, who belong to what I have termed the erethic constitution, whether the affection is early or advanced ; (2) phthisis in a very advanced stage ; (3) phthisis complicated with extensive emphysema ; (4) phthisis complicated with albuminuria ; (5) phthisis complicated with disease of the heart ; (6) phthisis with ulceration of the larynx ; (7) phthisis with rapid progress and constant pyrexia ; (8) phthisis with great

loss of substance ; (9) phthisis with considerable empyema ; (10) phthisis in persons who cannot sleep or eat in high elevations, or who feel constantly cold.

Some of these conditions are not permanent, but only temporary and removable obstacles ; and many of them, though, as a rule, not suitable, are in exceptional cases greatly benefited. The same exceptional effects are constantly found with remedies. Tendency to hæmoptysis was formerly regarded as forbidding mountain climates, but experience has shown that this is incorrect ; that, in fact, hæmoptysis occurs much less frequently in high than in low regions, and is often prevented and checked by a stay in high regions (Archibald Smith, Brehmer, Spengler, Unger, Dettweiler, C. T. Williams, Denison, Solly, Ruedi, Peters, and Hermann Weber).

After having discussed the general characters and influence of the climates of elevated regions, I must limit myself to a few remarks only on the principal health-resorts, as time compels me to do so ; and as there already exist numerous descriptions in the English language by professional and non-professional authors. I need not tell you that the difference between the different localities included in this class of climates is very great, and is as yet only partially

known and appreciated; that even in the same Alpine valley, and in the same place, there are great differences between different situations, and that the climate of the same place is by no means uniform in different years. Amongst others Mr. Waters has been occupied for some years with the investigation of the more tangible meteorological circumstances likely to influence the nature of different climates and their effects on morbid conditions ('Proceed. Manchester Lit. & Phil. Soc.' 1882, 1883, and 1884.).

We naturally begin with the Swiss Alps, as they are nearest to us, and with Davos Platz, about 5,100 feet above sea-level, as it was the first place resorted to just twenty years ago, when two patients migrated there from Görbesdorf, Dr. Unger and Mr. Richter, who there regained their health and are still living at Davos in active occupation. They were encouraged to give a prolonged trial to the place by Dr. Spengler, who had already written on the absence of scrofula and phthisis in the Davos Valley. As I had been on the look-out for a suitable place in the Alps for some years previously, in consequence of some encouraging experiences which, I might say, accident had thrown in my way, I soon afterwards began to send patients there.

When I first directed attention to Davos Platz in

1867 ('Brit. Med. Journal,' vol. ii.), it was still a charming primitive Swiss village; now numerous large and small hotels and villas stretch along the high road for more than a mile, and Davos Dörfli, a little higher up in the valley, may almost be considered as a suburb of Davos Platz. Waters, Spengler, Frankland, Unger, Clifford Allbutt, Addington Symonds, C. T. Williams, Burney Yeo, Ruedi, Peters, Marcet, Otter, Jaccoud, Sée, Symes Thompson, and others have amply described the peculiarities of Davos. The presence of good physicians, the more and more improving arrangements in the hotels, including sunny terraces and verandahs, the means of varied exercise and amusement, the comparative nearness to the railway, good roads thence (from Landquart or Chur) to Davos without an intervening high pass are accessory, though very important, to the general climatic characters of Davos Platz and Dörfli. A great drawback is that its reputation has of late years increased so rapidly that too many, frequently ill-suited, cases are sent to Davos; that the number and size of the hotels and health-establishments increase at an alarming rate, so that there is actual danger that Davos may be ruined by its own original advantages; *for purity or aseptic quality of the air is incompatible with the crowding together of a large number of invalids.*

Mr. J. Addington Symonds, the author of 'Davos in Winter,' has written on this subject in the 'Pall Mall Gazette' of Jan. 14, 1882 ; and I have likewise already mentioned this matter in a paper on Climate and Health-Resorts in the 'Book of Health.' If Davos were to be ruined, the calamity would not be confined to the inhabitants of the valley, but would be shared by many invalids all over Europe.

Lower down in the Davos Valley, at Davos Frauenkirch, a small hotel offers fair accommodation to a limited number of invalids ; and further down, but high above the bottom of the valley of the Landwasser on the sunny southern slope of the Rothornstock, about 4,770 feet above sea-level, lies Wiesen, of which Dr. Tucker Wise has given an attractive description. It is well sheltered from N. and N.E., but is rather more exposed to S.W. wind than Davos and the snow does not lie quite so long. The hotels and the social attractions are not so advanced as those at Davos, but the stay is less expensive, and under the guidance of Dr. Buol, an intelligent Swiss doctor, who is a licentiate of the London College of Physicians, results can be obtained in suitable cases, even with limited arrangements.<sup>1</sup>

<sup>1</sup> Dr. Buol has quite recently removed to Davos Platz, but is succeeded at Wiesen by a trustworthy Swiss medical man, Dr. Balzer, who likewise speaks English.

The Upper Engadine is a fair rival to the valley of Davos, and the village of St. Moritz, about 6,000 feet above sea-level and 280 feet above the lake, with the well-known Kulm Hotel and the houses of Kaspar Badrutt, represents the Davos Platz of the neighbouring valley. St. Moritz has been so well described by Dr. Burney Yeo, Mr. Lionel Tollemache, Drs. Ludwig, Biermann, and many others, that I must confine myself to a very few remarks. Davos is somewhat more sheltered and is slightly warmer than St. Moritz, and is nearer to the last railway station for those coming direct from England or the North. St. Moritz lies 900 feet higher, has the advantage of the snow somewhat longer, has decidedly more wind according to the observations of Mr. Waters, has a skating-rink and a good lawn-tennis court in the immediate neighbourhood of the hotel, and more opportunities for exercise. On the whole, Davos has some advantages for more serious invalids, St. Moritz for hardier cases.

The best sites in the Upper Engadine would probably be found in the neighbourhood of Pontresina on the south-western slopes of the Muraigl on the Munt Della Bescha; they would have the largest share of sunshine during the shortest days of the winter, would be in the immediate neighbourhood of pine and larch forests, and out of the way of the



Maloja wind ; but the hotel proprietors of Pontresina are as yet hostile to the scheme of a winter cure, fearing that their summer guests would leave them if they were to open that favourite spot for the treatment of phthisis. They are apparently strong contagionists. But there are sites, for instance, near Acla, about 6,000 feet above sea-level, to the right of the road from Pontresina to Samaden, over a mile from the former, where one or two health-establishments might be placed without prejudice to the visitors of Pontresina.

Samaden has been for many years used by some consumptive patients as a winter resort, and the excellent fare and service at the Hotel Bernina make up to some degree for what the absence of open and covered verandahs and balconies and terraces leaves to be desired. Above Silvaplana and Campfer, on the southern slopes of the Piz d'Albana and Piz Valaschin, good sites could be found. The establishment of the Kursaal Maloja is rather exposed to wind, and not high enough above the upper end of the Lake of Sils to be perfectly free from damp and mist at all times of the year ; but the Kursaal itself is dry, and the large corridors for indoor exercise, the arrangements for constant and abundant supply of warmed air to the rooms and passages, and the good

cuisine make atonement for some defects in the position. Dr. Tucker Wise, who is the resident medical officer, has given an encouraging description of these arrangements ; and such improvements as sheltered outdoor seats and pavilions were in the course of erection when I was there on a visit during the autumn of 1884. According to Dr. Wise fogs are very rare.

Independently of permanent residence the Maloja Hotel can do good service as a place of transition, for instance, during the melting of the snow, when outdoor exercise is difficult. A few weeks at this place will occasionally be an advantage to visitors at St. Moritz, or even Davos, as they can walk for hours every day in the well-aired corridors without exposure to draught or dampness. The localities mentioned, and Zuz in the Upper Engadine, are all the winter health-resorts in the High Alps which are open to us at present. There would be some satisfactory places in the Dolomites, as above Cortina, and perhaps San Martino di Castrozza and Campiglio, but there are no arrangements for the winter as yet.

In a much lower situation is St. Beatenberg, above Lake Thun (3,766 feet), quite sheltered from the north and east, quite open to the south, and very sunny. It is only lately that the proprietors of the Kurhaus

have commenced to keep the hotel open, and I cannot therefore speak of the results. The Hotel des Avants (3,212 feet above sea-level, and 2,000 feet above the Lake of Geneva) has a very sunny situation, and is already out of the region of mists in winter, though it is not quite free from them in spring. The arrangements of the hotel are good, but the snow does not lie so long as at Davos and St. Moritz ; and although preferable in many ways to the lower localities on the lake, it is not so bracing as the health-resorts in the Grisons. Seewis (2,986 feet), above the road from Landquart to Davos, has a cheerful, sunny, and sheltered situation. Such localities will probably, by degrees, take an important place as *intermediate health-resorts* for intermediate cases ; for such, to use an instance, in which the usefulness of higher localities is doubtful, or in which they are certain to be unsuitable, where, however, a surrender to the low level places is undesirable ; or as temporary places--viz. as steps to or from the higher health-resorts. Seewis, for instance, is well adapted as a stepping-stone to Davos and St. Moritz. In order, however, to become really useful, they must, as Seewis has done, provide themselves with good resident medical men, as without this it would be wrong to entrust to them cases requiring special care.

I must now name two localities in Germany which deserve your attention, although I can mention them only in a cursory manner: these are Görbesdorf in Silesia, and Falkenstein in the Taunus.

Görbesdorf, about 1,740 feet above the sea-level, is the cradle of the mountain health-resorts, and of the hardening open-air treatment in Europe, with a judicious admixture of hydrotherapeuties. Dr. Hermann Brehmer has the merit of having introduced this combination in a systematic manner, coupled with the strict supervision of the patients, essential in the hygienic as well as therapeutic management. Brehmer's establishment lies in a beautiful park, with a pine-clad hill belonging to it, arranged for graduated climbing. The establishment is provided with covered walks of great length, and with a winter garden, suitably warmed and ventilated.

Falkenstein, about 1,500 feet above the sea-level, has become, under the judicious as well as energetic guidance of Dr. Dettweiler, a health-resort where not only many invalids have been improved and cured, but where they have learned how to manage themselves afterwards. The results obtained at this establishment show how much can be done in phthisis by carefully arranged hygienic management, even with imperfect climatic elements.

During the last few years several other establishments have been formed which are likely to become useful and to lead to further imitation. Aussee in Styria (2,150 feet), St. Blasien (2,500 feet) in the Black Forest, Reiboldsgrün (2,257 feet), in the midst of a forest near the railway station of Auerbach in Saxony, and Badenweiler (1,380 feet) in a beautiful position on the south-western slopes of the Black Forest, deserve to be specially mentioned.

In Norway the Gausdal sanatorium, about 3,000 feet above sea-level and 2,500 feet above Lake Mjosen, and twenty-four miles from Lillehammer, has been mentioned to me as a probable health-resort for consumptives.

More important to us in the treatment of phthisis are the health-resorts of America. In the Peruvian Andes and the Rocky Mountains of the United States we possess indeed an endless variety of mountain climates. Near the equator, elevations of 6,000 and 8,000 feet have winter temperatures similar to our summer temperatures, and we must go still higher to find localities suitable to the treatment of phthisis. But at greater distances from the equator we come, at elevations of about 6,000 or 7,000 feet, to climates somewhat similar to those in the Alps at about 5,000 to 6,000 feet. In the neighbourhood of Jauja and

Huancayo, at elevations varying from 8,500 to 10,500 feet, several of my patients have recovered from rather advanced affections of phthisis, after I had learned the character of these climates, and had been encouraged in sending patients there by my late friend Dr. Archibald Smith of Lima, whose papers on these subjects are well known to you.

How different, however, these climates are from the Swiss Alps, you may see from the following statement of Archibald Smith:—‘At Huancayo,  $12^{\circ}$  S. lat. and  $75^{\circ} 12'$  W. long. the annual range of temperature in the shade may be taken as ranging from  $8^{\circ}$  or  $9^{\circ}$  to  $14^{\circ}$  R.; while at the cooler town of Jauja, with from 10,000 to 15,000 inhabitants, the range during one whole year has been observed not to exceed from  $8^{\circ}$  to  $12^{\circ}$  R., or from  $50^{\circ}$  to  $59^{\circ}$  or  $60^{\circ}$  F., with the sky always clear and sunny, and an atmosphere pure and bracing, which invites to outdoor exercise and enjoyment.’ From no other localities have I seen such good results as from Jauja; but also from Santa Fe de Bogota (about 10,000 feet), Quito (about 10,000 feet), La Paz (12,000 feet), and Cuzco (11,250 feet), I have occasionally received good reports. Arequipa, in Peru,  $16^{\circ}$  S. lat. has lately been recommended by Dr. Dixon Hunter, with an equable temperature, averaging about  $65^{\circ}$  summer and winter

within the house, and outside in the shade during the day. I have no doubt that this climate is infinitely better than many others, especially the hotter regions along the sea-shore, and that consumption can be cured there ; but it is somewhat too warm.

The Rocky Mountains in the United States of America have only been used as health-resorts in phthisis, so far as I know, during the last fifteen or sixteen years, and they seem to have met likewise at first with much opposition ; at all events, during the last ten years the advice I have given to several American consumptive patients to settle at Denver or Colorado has been rather severely criticised by New York and Philadelphia doctors, especially in two cases of hæmoptoic tendency, and yet these patients did well when they afterwards carried out the advice. Manitou springs (6,315 feet), Colorado springs (5,775 feet), and Denver (about 5,000 feet) are the best known localities, and have been repeatedly described by Drs. Denison and Solly ; but numerous other resorts of the future are mentioned in Dr. Denison's instructive work on 'The Rocky Mountains Health Resorts.'

Dr. Frankland has quite lately mentioned to me in this territory a locality which is likely to become an important health-resort — Yellowstone National Park, accessible by the Northern Pacific Railway.

It is situated on the eastern slopes of the Rocky Mountains, between  $44^{\circ}$  and  $45^{\circ}$  N. lat. 'The park abounds in magnificent geysers and boiling springs on a most gigantic scale, and there are plenty of mineral waters. The boiling water and steam might be made available for warming hotels, but there is also an abundance of wood fuel. There is so much room in Yellowstone that there need be no overcrowding as at Davos.'

Mexico, too, possesses good health-resorts, especially the town of Mexico and Puebla, about which the well-known works of Jourdanet and Guilbert contain valuable information.

The South African altitudes have been described by Symes Thompson and the late Harry Leech and by several non-professional writers—Trollope, E. F. Sandeman, and Otter. The most important health-resorts are contained in the Orange Free States, Griqualand West, and the Transvaal. Bloemfontein (4,700 feet) is the best-known place ; but among others equally suitable are Christiania, Bloemshoff, Potchefstroom, Witwater Rand, Pretoria, Heidelberg, Utrecht, Standerton, and Wakkerstroom. Everywhere the climate is dry, and often in summer very hot, and in winter cold. I have seen some good from these localities, but the promise of 'the



absolutely perfect cure ' held out many years ago by some inhabitants of the Free States has not been fulfilled.

Whenever we recommend these regions we must bear in mind that a sea voyage and a long land journey are implied. Those who are good sailors will not regret the former, and the latter can be rendered beneficial if the invalid is not too weak and does not mind expense. The best mode to reach the high regions is still a well-supplied ox waggon from Graham's Town or Wynberg. 'Waggon travelling with the traveller's own oxen,' Mr. Otter justly says, 'is very slow work, not averaging more than ten to twelve miles a day, but as such an expedition is only made for the sake of health, the rate of travelling is not material, and when once a traveller has got into a district which is suitable to him he is in no hurry to get out of it.'

Many of the great mountain chains of Asia contain, no doubt, useful health-resorts, but our dependable knowledge is almost confined to the Himalayas, which enclose, you may say, all varieties of climate, stretching along as they do for about 2,000 miles, with an average width of 180 miles, and elevations ranging from 1,000 to 23,000. There are, besides, the Neilgherry range, the Pulneys, the Aravulli or Aravelli

Mountains, the Vindhya range, the Western and Eastern Ghauts, and several other ranges. There are health-resorts varying from 4000 to 8000 feet elevations.

In considering these stations we must always bear in mind the nearness to the equator, and, further, that the peninsula is surrounded, excepting its broad base, by enormous masses of warm water. The periodical winds coming from these seas are saturated with vapour, which on reaching the cooler mountain ranges is partly deposited as rain. The emanations from the damp soil are probably laden with microbic life. The majority of the Indian Hill stations have therefore very different climatic conditions from those of the Peruvian Andes, the Rocky Mountains, and Swiss Alps. These circumstances may explain the contradictory views of Anglo-Indian medical men regarding the influence of their hill stations on phthisis. The carefully-drawn-up report, however, of Dr. Kellet on consumptive soldiers, who spent six months (April to November) at the convalescent station of Landour, shows results which are not unsatisfactory.

Very different must be the climates on the northern slopes of the Himalayas, for the atmosphere before reaching them has lost the greater part of its moisture on the southern slopes and highest ridges; the

climates must, therefore, be drier and cooler, and probably Thibet (9000-11,000 feet) and Cashmere (5000-6000 feet) contain most healthy climates.

I had intended to survey with you, gentlemen, the climates of Nubia and Egypt ; of Algiers, Italy, Spain, the Riviera, and south-west of France ; of Australia, New Zealand, Madeira, Teneriffe, and the high seas, in their applicability to the treatment of phthisis ; but time fails, and I hope you will pardon me for having spent so much time over other matters, and that you will not think I regard the regions which I pass over as useless. They have been so often and so well described by others, and have elsewhere been discussed by myself, that my present omission can scarcely be regretted.

Many of the localities included in these climates possess very useful qualities for the treatment of phthisis, and especially for those conditions and constitutions which are either temporarily or permanently debarred from the benefits of the altitude climates ; but I regret to say that as yet the arrangements are nowhere perfectly satisfactory, even at the most favourite places, supplied with all the modern comforts, such as Cannes, Mentone, and San Remo ; the majority of invalids are in the habit of acting almost independently of their medical advisers, and

many perish who under strict guidance might have been saved. The personal character and professional superiority of a Dr. Frank, a Bright, a Charles, a Siordet, or of some of the other physicians practising there, may in some, even in many, cases exercise so powerful an influence as to command a willing obedience; but the whole system of this looseness of tie between doctor and consumptive patient is deplorable, and the results obtained are very inferior to those which might be obtained by judiciously arranged health-establishments, under strict medical guidance in every point of general and personal hygiene. This, however, is by many invalids not yet regarded as the principal sphere of the physician's work, but more or less as everybody's business, for which no doctor is required, and which each individual must find out for himself. Hence a most disastrous neglect of the all-important arrangements of the daily life of the invalid, arrangements which require constant modifications according to changes occurring in the patient himself, and in the surrounding circumstances, and demand therefore the judgment of the physician, who is acquainted with the changing condition of the patient, and with the climatic peculiarities of the place.

I also regret very much that I cannot properly

discuss the climates of Great Britain and Ireland. These islands contain on their different coasts and in their interior a great variety of climates, which have been well described by Sir J. Clark, Thorowgood, C. T. Williams, Tripe, Buchan, and others, and I have likewise given short sketches of them. With all the differences, great as they are, between the east and west, south-east and south-west coasts and the different inland localities, there are certain traits of character more or less common to all of them—viz., a high degree of humidity ; greater warmth than is due to the geographical latitude ; comparative equability with regard to seasons and periods of the day ; an analogous degree of sunlessness and dulness of atmosphere ; and considerable movement of the air, almost amounting to windiness.

All these localities as a set-off possess hygienic arrangements which are superior to anything which is to be met with abroad,—good food, and good accommodation ; they are of easy access, and do not require a complete separation of the invalid from his family. The physiological influence on the constitution, compared with foreign localities of a similar elevation, may be designated as more or less tonic and health-giving, though not exhilarating, and as requiring a certain degree of energy and integrity of constitution.

We possess in these islands good climates for preventive treatment ; but we are not so well provided with localities assisting the treatment of developed phthisis, where the lungs and the constitution have partially lost their integrity and energy. We ought therefore to do everything to mend the defects of these our climates, and to render the good qualities available, and concentrate them if possible.

Is this done at our health-resorts for the treatment of phthisis? No, gentlemen, there are no such arrangements, or almost none, on the coasts of Devonshire, Hants, Sussex, and even the Isle of Wight, excepting the few sanatoria. Let us use our influence with our local professional brethren, who are neither deficient in knowledge nor in insight, and with the local proprietors and public, to obtain well-placed and well-arranged houses for the invalids, with suitable balconies on which light couches and shelters for open-air treatment can be placed, good large verandahs with movable glass doors ; open and covered walks and winter gardens for exercise in windy and rainy weather ;<sup>1</sup> seats of different nature with turnable shelter ; quadripartite glass-covered seats, like those

<sup>1</sup> I am glad to add that Dr. Bowles has directed my attention to and has shown me a winter garden just established in connection with the Pavilion Hotel at Folkestone, and also a large quadripartite

at Hastings and St. Leonards, for which these places deserve commendation ; walls for shelter from wind, and for reflection of the sun when it shines. We must induce our patients to place themselves under the entire control of their local doctors during their whole stay at one of our health-resorts, and to learn that the guidance of the doctor is as important as the climate, and in many cases more so. By judicious management the doctor is often able to counteract the disadvantages of an indifferent climate and to bring into action all its good points, while without the guidance of an intelligent physician the natural and social attractions associated with a satisfactory climate may become sources of failure.

There is no doubt in my mind that it would be a very great advantage to many invalids, especially those who are not very rich, if there were well-arranged health-establishments under the supervision of good medical men, and that through them better results could be obtained from our home climates.

And once more, gentlemen, let me plead for the multiplication of small hospitals in good situations sheltered seat on the beach. This is, indeed, a great progress, and ought to be imitated at every health-resort. According to the number of invalids, there ought to be several such winter gardens in different parts of a health-resort, and a number of such sheltered seats.

for the consumptive poor, such as I have sketched in the second lecture. You have always treated me with so much kindness and consideration since you have, so to say, adopted me as one of yourselves, that I am hopeful you will give your countenance to the plans I have suggested, and that through you they may lead to some good. Then, gentlemen, the recollection of the hours which I have had the pleasure of spending with you in these lectures will belong to the brightest of my life.



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